EXCAVATING ENGINEER

FOUNDED 1905

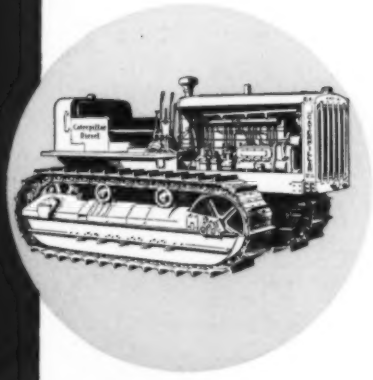
Vol. XXX 1936

Number 9

TRANSPORTATION LIBRARY

One of Thompson-Starrett's big walking draglines at work on the Colorado River Aqueduct. Story of the operation begins on page 459.

WHEN IS IT TIME TO TRADE IN YOUR PRESENT MACHINE?



If you are now using a gasoline tractor or motor grader, right now is the time to replace it with a "Caterpillar" Diesel. Its tremendous savings in fuel costs—its low maintenance costs—its power and endurance—are fast obsoleting other forms of power. Today's jobs demand the "Caterpillar" Diesel. You can't do today's jobs with yesterday's power—not if you want minimum costs.

More than 15,000 "Caterpillar" Diesels—tractors, motor graders and engines—are already in use. The number is fast increasing. Resale values of used gasoline tractors have dropped—seem certain to drop further. Replacement now gives you two important advantages—you begin immediately to enjoy the savings of "Caterpillar" Diesel power—you avoid further obsolescence loss on your present equipment. See your dealer for the SHOW-DOWN on this question. Caterpillar Tractor Co., Peoria, Ill., U. S. A.

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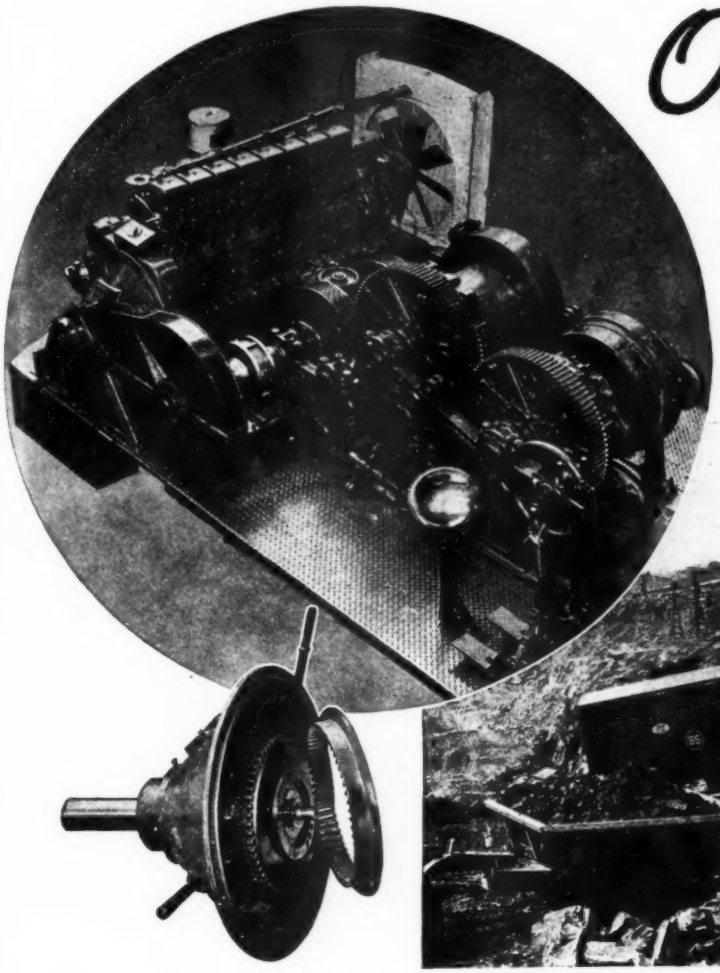
DIESEL



Outstanding

SIMPLICITY OF DESIGN

plus ability to stand hard usage

● Facing one tough job after another, a power shovel has to have a heavy-duty engine . . . and a power take-off rugged enough to transmit full engine horsepower and to stand years of hard usage.

The Twin Disc X8295 Power Take-Off has that ability . . . plus the outstanding simplicity of design which makes it easily adaptable to Harnischfeger machines, say engineers of the Harnischfeger Corporation, builders of material handling machinery for over fifty years.

The clutch being a disc clutch requires no counter weight such as is needed with a shoe clutch where counter weight is required to offset the centrifugal force. Twin Disc internal gear design is also a valuable feature, as it spreads the wear of connecting parts over a large area and also acts to take care of any slight misalignments which result from severe field service.

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(The fifth of a series of five advertisements).

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5. **Timken Bearings**

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Over-size "Mirror Finish" adjustable Timken roller bearings are used for the main bearings of I-R Two-Stage, Air-Cooled Portable Compressors.

The use of roller bearings reduces the distance from the center of the main bearings to the center of crank pin bearings, permitting a short, rigid crankshaft.

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Their tapered construction enables the bearings to carry radial loads, thrust loads, or both in combination.

The line contact of the tapered rollers and races assures maximum support and rigidity for the crankshaft under all operating conditions.

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EXCAVATING ENGINEER

FOUNDED 1905

DEVOTED EXCLUSIVELY
TO EXCAVATION

About Excavating Projects — By Excavating Men — For Excavating Men — The World Over

Vol. 30 **SEPTEMBER, 1936** **No. 9**

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Looking Ahead

These interesting articles will appear in early issues of Excavating Engineer. Watch for them!

Building Fort Peck Dam

Dredging operations for the earth fill core, diversion tunnel construction, and the excavation for the spillway will be presented in a series of articles starting in an early issue.

Quarrying Quartzite

On Rib Mountain, Wisconsin's highest point, Foley Brothers, Inc., quarry an unusual rock, haul it five miles into Wausau, where it is made into granules for roofing paper. Special problems presented by the rock formation are ingeniously met in lowering costs.

Published Monthly by **THE EXCAVATING ENGINEER PUBLISHING COMPANY, South Milwaukee, Wisconsin, U.S.A.**

F. O. WYSE
Managing Editor

ARNOLD ANDREWS
Editor

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D. B. REED, JR.
Assistant Editor

E. M. HEUSTON
Advertising Manager

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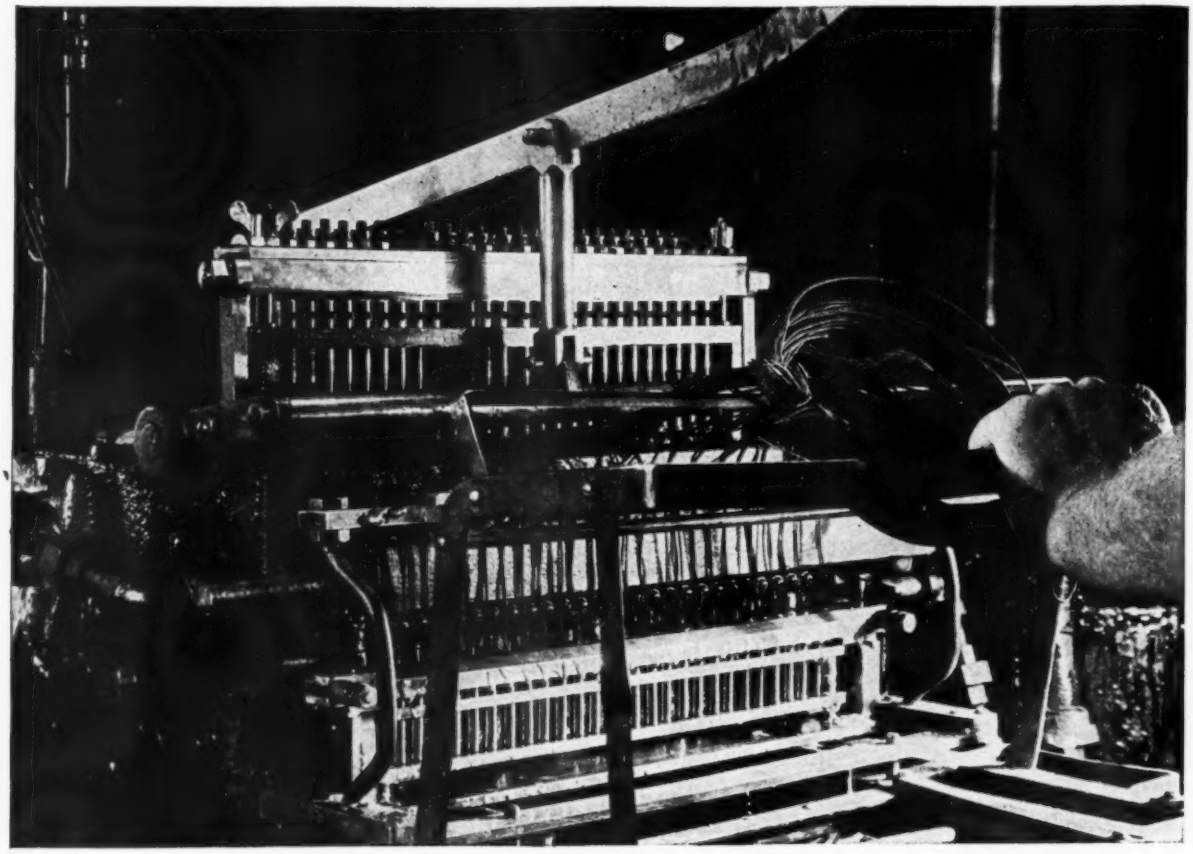
MAKING BETTER BLASTING CAPS



PUTTING ON THE PRESSURE

One important reason for the superiority of Hercules electric firing devices is the effective waterproofing seal. By **pumping** waterproofing into the shells under pressure (an exclusive Hercules development), air bubbles and cavities are eliminated. Thus, this possible cause of misfires is prevented.

Another check against misfires is the basic design of the Hercules firing assembly. The snug-fitting, straight-sided plug resists any tendency of the waterproofing to seep through to the bridge wire. Construction details, such as these, help you to obtain satisfactory blasting results.

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AMERICAN TIGER BRAND IS USED TO *rough going*

AMERICAN TIGER BRAND WIRE ROPE

WHEREVER the going is tough —and the need for exceptional dependability exists — American Tiger Brand Wire Rope will establish remarkable records for its users.

This wire rope has proved its worth in keeping equipment in operation, in doing away with costly replacements and in lowering operating costs. Experience has proved its superiority. Always specify American Tiger Brand Wire Rope. Convenient stocks and our nearby engineers are both at your immediate call.

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UNITED STATES STEEL

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Not in the Contract

"Are you going to take this lying down?" boomed the candidate.

"Of course not," said a voice from the rear of the hall, "the shorthand reporters are doing that."

"Well, I think I'll put the motion before the house," said the chorus girl as she danced out onto the stage.

An Irishman was relating an experience of hardship in the jungle. "Ammunition, food, and whisky had run out," he said. "We were parched with thirst."

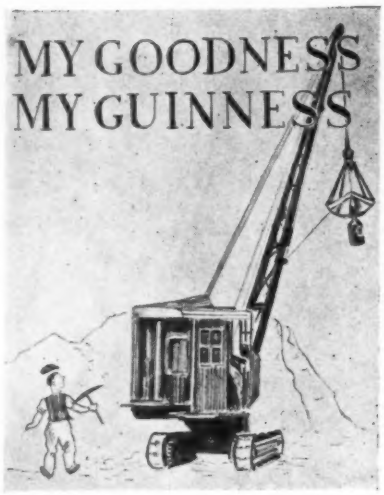
"Was there no water?" asked a listener.

"Sure, but it was no time to be thinking of cleanliness," replied the Irishman.

Oiler: "Don't bother me. I am writing to my girl."

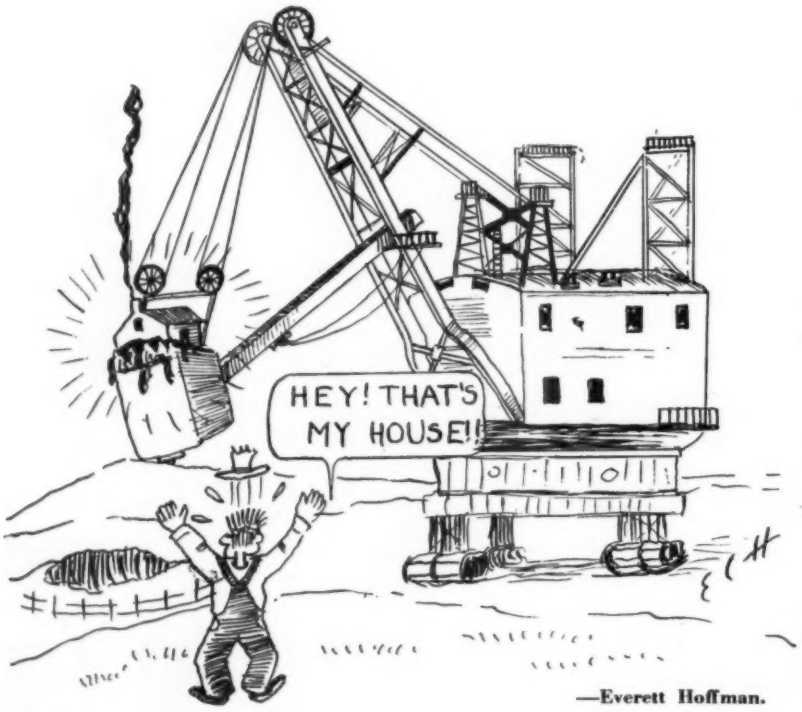
Shovel Runner: "But why are you writing so slowly?"

Oiler: "She can't read very fast."



At the wedding reception the young man remarked: "Wasn't it annoying the way that baby cried during the whole ceremony?"

"It was simply dreadful," replied the prim little maid of honor. "When I get married I'm going to have printed right in the corner of the invitations: 'No babies expected.'"



—Everett Hoffman.

Farmer: "See here, young feller, what are you doing up that tree?"

Boy: "One of your apples fell down and I'm trying to put it back."

"Does you take this woman for yo' lawfully wedded wife?" asked the colored parson, glancing at the diminutive, watery eyed, bowlegged bridegroom, who stood beside his 210 pounds of feminine assurance.

"Ah takes nothin'," gloomed the bridegroom. "Ah's bein' took."

Doctor: "You must avoid all forms of excitement."

Contractor: "Gee, Doc, can't I even look at them on the street?"

Teacher: "Jimmie, can you tell me how matches are made?"

Jimmie: "No, ma'am, but I don't blame you for asking."

Teacher: "What do you mean?"

Jimmie: "Well, my mother says you have been trying to make one for twenty years".

Foreman: "You missed work yesterday, didn't you?"

Pitman: "Not in the least, sir, not in the least."

Mazie: "You've been stenographer for pretty near all the big shots in this contracting firm, haven't you?"

Mabel: "Yes, I'm just about on my last lap now."

"Folks," said the colored minister, "the subject of my sermon dis evenin' am 'Liars.' How many in de congregation has done read the sixty-ninth chapter of Matthew?"

Nearly every hand in the congregation was raised immediately. "Dat's right," said the preacher, "You is just de folks I want to preach to. Dere is no sixty-ninth chapter of Matthew."

Everett Hoffman, who drew the cartoon at the left, was 14 years old on August 18. His Dad is in the shovel business, and our guess is that Everett will be following in his father's footsteps.

ATLAS

DIESEL POWERED SHOVELS

Excavate base for Clippers!

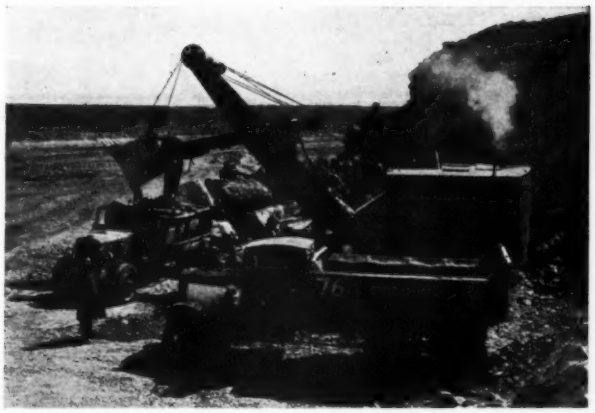
When the U. S. Navy acquired the Alameda airport from which the giant Clipper Ships of Pan-American Airways have been winging their way over the vast expanse of the Pacific Ocean to the Philippine Islands, the Western Terminus of the Clipper Ships was transferred to the San Francisco Municipal Airport on the West side of San Francisco Bay, south of the Golden Gate.

The seaplane base fill required 1,150,000 yards of material with a rock seawall 5600 feet long and 2000 feet of breakwater to give an area of 2600 by 2800 feet, all of which is to be dredged to a depth of 10 feet with a 1000 foot channel.

A hill of rock had to be moved from where nature left it to make the seawall and breakwater, and here, as in most other major construction projects, Atlas Diesel powered shovels have shown their mettle. On this job Granfield, Farrar & Carlin, San Francisco grading contractors, used two Atlas Diesel powered Bucyrus-Erie shovels, and excavated a total of 179,000 yards.

On nearly every major construction project you will find Atlas Diesel powered shovels and draglines, doing Herculean service in building dams, levees, roadbeds and similar excavating jobs. Atlas Diesels predominate in the excavator field — more Atlas Diesels being used in this service than the engines of all other Diesel builders combined.

When you buy a power shovel or dragline—specify an Atlas Diesel as the power unit and be sure of satisfactory power and low cost operation and maintenance. Ten different sizes of engines are available—from 45 to 275 H.P. Write for details.



ATLAS IMPERIAL DIESEL ENGINE CO.

Oakland, California « » Mattoon, Illinois

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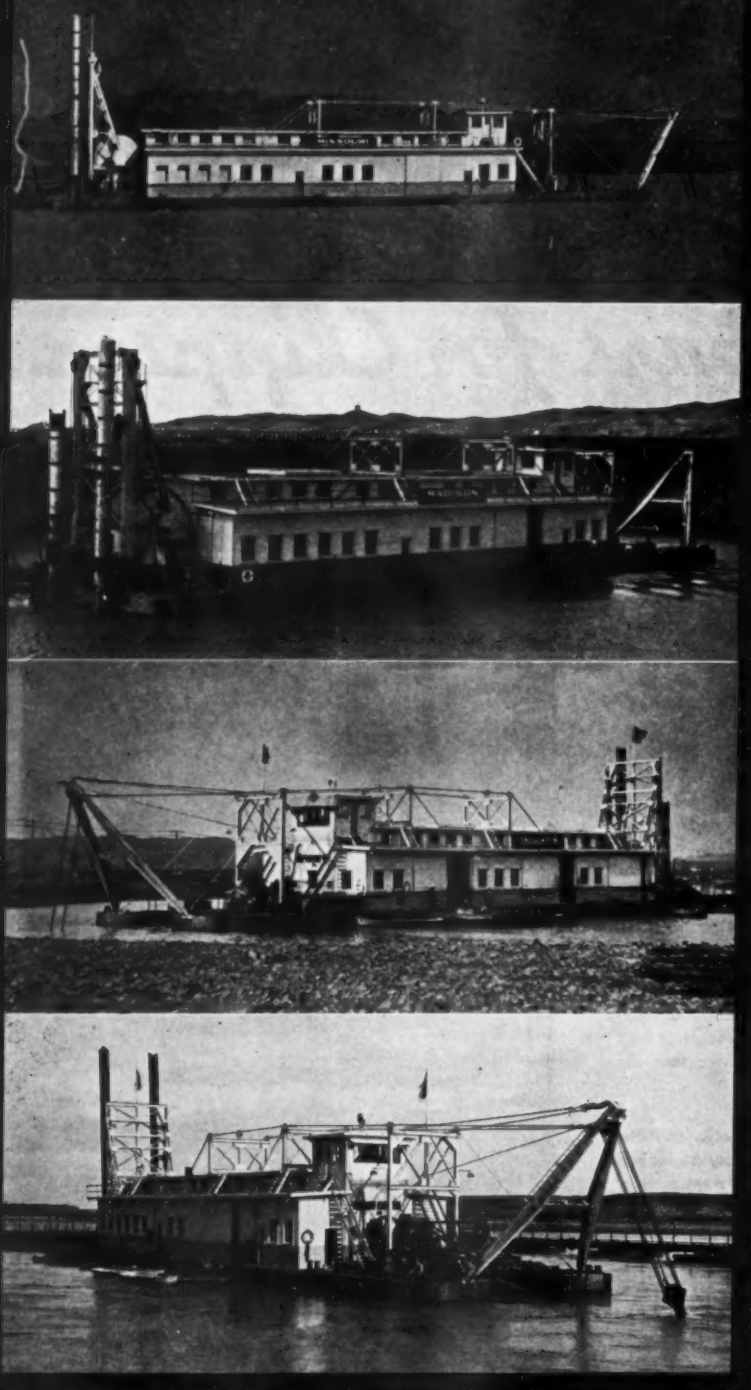
BUCYRUS-ERIE



these four hydraulic dredges at Fort Peck Dam are built with Bucyrus-Erie pumps and digging equipment. On great hydraulic projects the world over, Bucyrus-Erie dredging equipment has proven its ability to give you bigger, steadier output, less grief, fewer delays, lower unit costs. Check into the savings Bucyrus-Erie dredges can make on your next job. Write:

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT... SOUTH MILWAUKEE, WISCONSIN, U. S. A.

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EXPECT THE MOST PROFITABLE HALF-HOUR YOU'VE EVER SPENT!

WHEN YOU TALK to the Socony-Vacuum Representative you get facts that can be substantiated to the last dot by definite proof.

This is particularly important when it comes to purchasing lubricants for your machinery, because upon the efficiency of your units depends the amount of production they can turn out; the profits you can expect.

• • •

Socony-Vacuum Representatives cooperate with your men; those who know your own problems best. This often leads to improved work and worth-while operating economies.

SOCONY-VACUUM OIL CO., INC.

INTERESTING EXAMPLE NEXT PAGE

LOWERS YEARLY OIL COST BY $456

● An Eastern contractor turned to Gargoyle D.T.E. Oils for his 3-ton excavator. He soon found an annual saving in his oil bill of $456. Extension of renewal period for the oil made an additional saving of $25 a year.

Savings in oil cost aren't important? *Don't you believe it!* With Gargoyle Oils these savings come from results which lead to lower repairs . . . greater serviceability for all your equipment . . . more accurate estimates.

For cables, trucks, tractors, shovels—wherever friction is fighting profits—hundreds of contractors have proved Gargoyle lubricants help beat estimates. Let us supply you with the *right* lubricants . . . help your men—through our trained engineers—find the places where the right oil will safeguard your profits.

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GARGOYLE
Lubricants

Make Use of the Industrial Experience of
INTERNATIONAL HARVESTER
When There's a Power Problem to Be Solved

Above: An International TracTracTor pulling a road grader on a country road project. International TracTracTors are available in three models: the compact T-20, the TA-40 (shown above), and the Diesel-powered TD-40.

●

The International Harvester line of industrial power includes wheel-type tractors, TracTracTors, stationary power units from 12 h. p. to more than 100 h. p. and 1½ to 5 h. p. engines for light-duty service.

● Before long the *Millionth* Tractor of International Harvester manufacture will be coming off the assembly lines and going out to handle somebody's power job. That's by long odds the biggest tractor-production figure in the industry. It is also a measure of our thirty-year experience in this field —experience which will be of value to you when you have a power problem to handle and need efficiency and economy on the job.

If your work calls for powerful crawler or wheel tractors, small tractors for cramped areas, fixed power units, small engines or motor trucks — call on a branch or authorized industrial dealer in the International Harvester sales-service organization.

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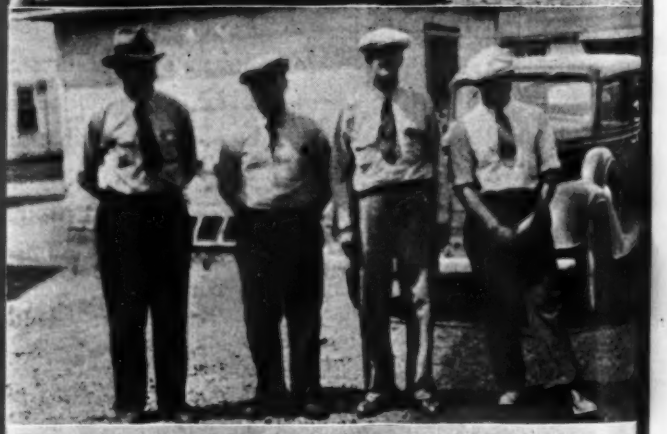
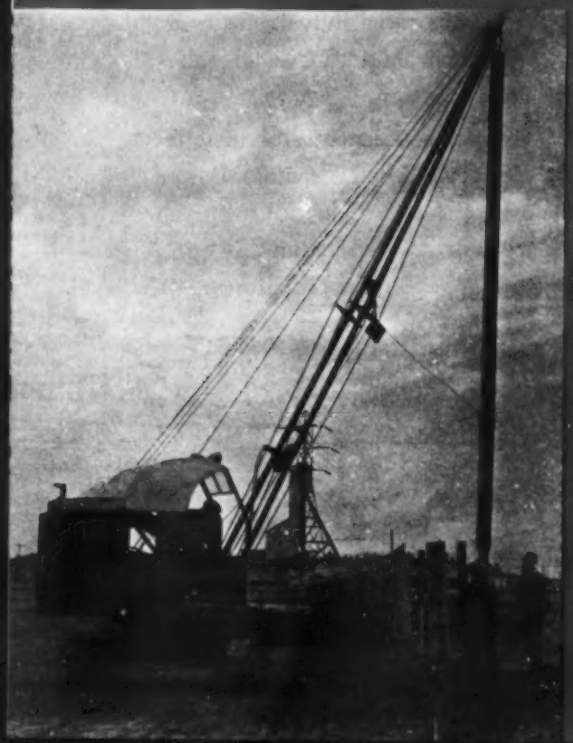
EXCAVATING

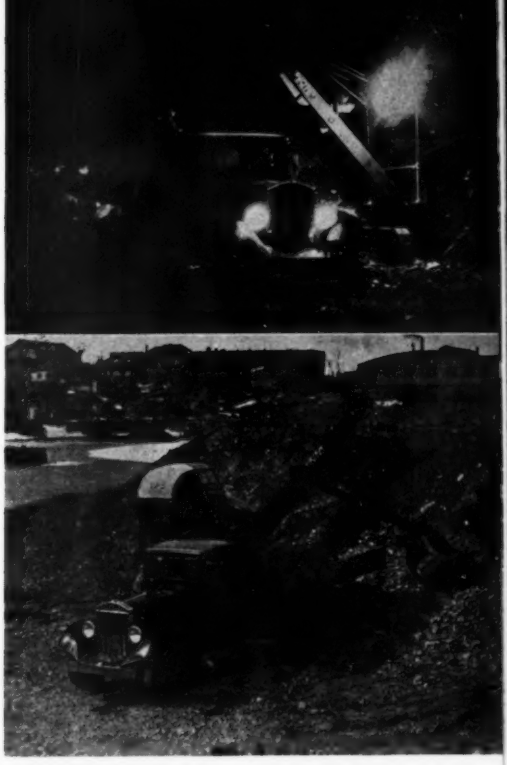
Above: General view of a portion of Wright-Hargreaves surface plant at Kirkland Lake, Ontario. Right top: Unloading the ⅜-yard shovel (also used as dragshovel and crane) preparatory to moving it in on a succession of "handy-man" jobs. Right center: Part of Wright-Hargreaves personnel. Left to right: P. Bennett, chief electrician; W. Smith, master mechanic; M. Black, mill superintendent; H. Halverson, surface foreman. Right bottom: Working on swampy ground in constructing the dams for disposal basins, the 10-B operated on heavy plank mats. Below: One of the speedy little machine's many jobs was driving fence posts. The ingenious pile-driving set-up is described in the following article.





Handy-Man of the Mine

By **MALCOLM BLACK**
Mill Superintendent



• *Backfilling at the mine is one of the numerous jobs handled by the ⅜-yard shovel. Operation continued night and day, as shown above. The interesting illumination system used is described on page 458.*

DURING the first few years operation, the precious metal mines of northern Ontario generally have little, or no difficulty in finding a source for the disposal of mill tailings.

As a rule, there is a river, or lake nearby, into which residual sands may be discharged. The time comes, however, in most cases, when those natural outlets become filled, and others must be found.

Such has been the case in this district, where several of the mines, adjacent to the lake (Kirkland Lake, located about 165 miles due east of Port Arthur, in Timiskaming County) used it as a disposal basin for a number of years.

In seeking a new site, Wright-Hargreaves Mines, Limited, were fortunate in securing several 40-acre claims in one group, about two miles from the plant. The greater portion of this land is covered by two swamps immediately adjacent to each other, but having a difference in elevation of about 12 feet. Those are designated as No. 1 and No. 2 disposal basins. The former has an area of about 65 acres and the latter 35 acres. Both are bordered on two sides by rock outcrops, having an average height of about 30 feet above the swamp.

Wasting Residue Through Perforated Pipe Line

By building a dam at each end of those swamps, two very satisfactory disposal basins were created. The residue from the mill, consisting of very fine sand 80%-85%-325 mesh diluted 3;1, L to 5, is conveyed to those basins by means of 12-inch wood pipe, which runs parallel with the edge, until it reaches the far end of No. 1 basin. At this point it makes a 90 degree turn and continues to the opposite side. This latter portion of pipe has 1-inch holes, spaced 10 feet apart, through which the sand is discharged. This method insures even distribution instead of piling up in one place.

When one basin is full, the feed is diverted to the other, and, in a few weeks, the water has drained off, leaving a bed of sand several feet deep. Dams must now be made at each end before the next cycle of filling can start.

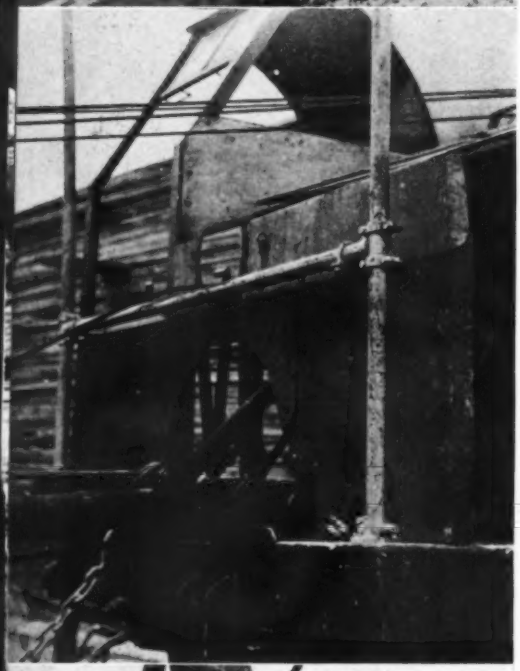
To expedite the work of building those dams, a 10-B Bucyrus-Erie dragline shovel was purchased. Powered with a 4-cylinder Buda Diesel engine, the machine swings a ⅜-yard dipper on a 14"6' drag boom. It has a working weight of about 17,700 pounds, a maximum digging radius of 22 feet, and can travel at speeds up to 4¼ miles per hour. The bed on which it has to work is comparatively soft, therefore a mat has to be used to prevent the machine from sinking. This mat consists of several sections of wood, 20' long, 3' wide, and 6" thick, each being fitted with two wire cleats to facilitate moving. In transferring those heavy sections, the bucket is tucked under the boom and fastened there. A chain is then passed through the mat cleats and around the boom. In this manner, the shovel may advance to a new position, a distance of about 15 feet, in about five minutes.

Soft Material Presents Dumping Problem

The material used for the dams is the sand that has accumulated at that point. A trench about 15' wide and 6' deep is dug, and the excavated material heaped along one side.

When work was started on this project, it was found that the original bucket, (being designed for comparatively dry material) was not quite suited for the soft putty-like material encountered;

Wright-Hargreaves find so many uses for their speedy ⅜-yard shovel at their mine in the new Kirkland Lake mining district of Northern Ontario that . . . "There is no telling what they will make it do next."



● *The close-up of the 10-B on foundation work at the left shows the two 2500-lumen, 6.6 ampere lamps used for night work. The system was designed by Chief Electrician Bennett so the machine could develop its own light, and eliminate the necessity of building permanent installations at the various sites where the shovel works.*

the sides didn't have enough taper, which caused trouble in dumping the load. Also, the teeth caused considerable agitation in the bottom of the trench, thus forming a hard-to-handle slime.

A special bucket, to meet those conditions, was designed by H. Halverson, and made in our shops, under the supervision of W. Smith, master mechanic. It is of ½-yard capacity, made from ⅜-inch steel plate, and is fitted with a special steel lip. It also has a number of ¾-inch holes drilled in the bottom so that, in dumping the load, a vacuum is not formed. The sticky material leaves this bucket without trouble.

On this particular job the 10-B handles 75 tons of material per hour, at a cost of about 2c per ton. Segregated costs are:

Operator	**$5.60 for 8 hour day**
Helper	**4.80 for 8 hour day**
8 Imp. gals. fuel at 13c	**1.04**
2 gal. lubricating oil at 85c	**1.70**
Total	**$12.44**

The distance from the plant to dam is about two miles, over an extremely poor type of wagon road. The time occupied in reaching there with the shovel, is about three hours.

Owing to the severity of winter in this district, the dams must be made during the summer months.

More than 400,000 tons of solid residue is sent to disposal site per year, this is amply taken care of in one basin.

Any Odd Jobs Today?

The first dams were made in about three weeks, working 8 hours per day. This alone more than paid for the original expenditure on the 10-B. However, that does not imply idleness between dam building periods. There are many odd jobs around the property to keep it busy. Those include:

1. Moving scrap in yard
2. Erecting steel work
3. Digging trenches for water works
4. Excavating cellars for new buildings
5. Driving fence posts and piles
6. Loading mine backfill

● *Directly below is a photograph showing the Wright-Hargreaves machine operating as a dragshovel on dam work. Note the water escaping through the holes in the dipper bottom. Soft, putty-like material encountered on this job made necessary the use of this special type of construction. To the left is a detailed view of the dipper, designed by H. Halverson and made under the supervision of Master Mechanic Smith.*

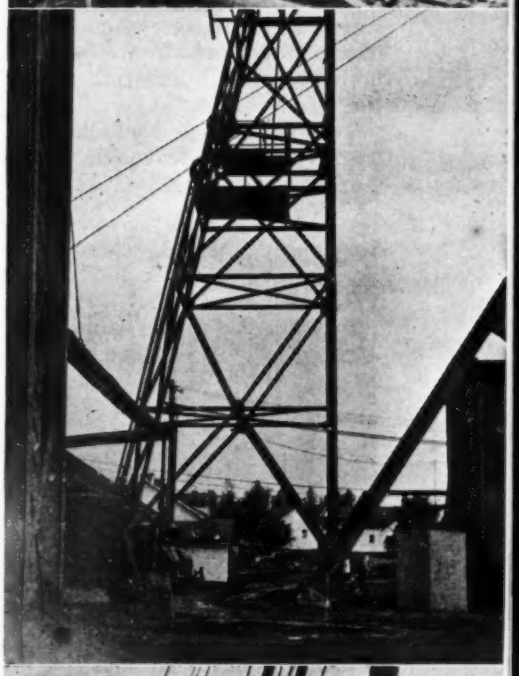
For jobs such as erecting steel, and driving fence posts, the shovel boom is replaced with that of a homemade crane boom, 35 feet long, made from 3-inch extra heavy pipe, braced with ¾-inch stay rods. Changing booms takes only a few minutes.

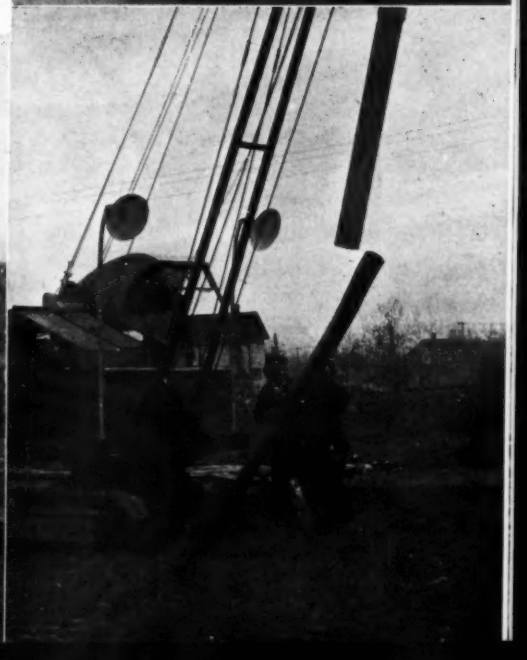
Two Blows Per Fence Post

In making the new Wright-Hargreaves sports field, the fence posts, and piles for the grandstand were driven by the 10-B. For this work, about 20 feet of 8-inch pipe is suspended from end of boom. Inside this pipe is a piece of 6-inch steel shafting weighing 500 pounds. It is suspended by the operating cable, the other end of which is wound around the hoist drum. A post is inserted in lower end of the pipe, and is held there by the helper, while the operator maneuvers it into position. The hammer is raised to near the top, then the clutch is suddenly disengaged, sending the hammer crashing down on top of the post. It is seldom that more than two blows are required to send the post about 5 feet into the ground. Those posts were driven at the rate of 35 per hour, using three men, including shovel operator, at a cost very much lower than could have been done by hand.

The grandstand at this new park is 125 feet long, and capable of seating 400 persons. It is built entirely of wood, and in the form of an arc having a radius of 90 feet from the home plate. The structure rests on piles driven at 5-foot centers, and from 6 to 8 feet in the ground. All the piles were driven by the 10-B, the cost being about 7c per pile. In connection with an addition to one of the company owned residences, it was necessary to excavate a cellar, 38'x30x10'. The 10-B, equipped with the regular shovel, after going down a few feet encountered an outcrop of rock of considerable size, and, at another point, quicksand. Because of this bad combination, the job had to be finished with the shovel operating from the surface. The

● *Rock and quicksand made it impossible to excavate the foundation shown at the right with the regular shovel equipment. Consequently, the machine was moved to the surface and the crane boom and "oil-drum" bucket shown pressed into service. Note the blasting mat above the bucket. Steel for the 65-foot tower illustrated at the right was handled, up to the 50-foot level by the 10-B. An extension to the crane boom provided a total reach of over 50 feet.*





● *Below: Early construction work on the grandstand at Wright-Hargreaves' new sports field. The 125-foot-long structure is supported on piles spaced at five-foot intervals and driven from six to eight feet into the ground. Four hundred people can watch the local ball games from the stand. At bottom, right, one of the piles is being inserted in the lower end of the casing through which a 500-pound steel "hammer" connected to the main hoist drum does the driving.*

home-made boom was put into service, and a mine type bucket used for removing the blasted rock, and other remaining material. The bucket in this case was made from a heavy steel oil drum. In handling the blasting mat, the bucket was disengaged, and the chain passed around the mat.

This excavation, including 30 tons of rock, which had to be blasted, was handled for a total cost of 4c per cubic yard.

Mine Backfilling

The word "backfilling" as applied to mining means, filling with waste rock or gravel, the space formerly occupied by ore in the stopes of the mine, without this means of support, the walls would probably cave in and ruin a portion of the mine.

To receive this backfill, it is customary to drive a raise through to surface. There are several such raises on this property, each serving different sections in the mine.

Several old waste dumps on surface are at present being used for backfill, supplemented by gravel from a pit nearby. The loading onto trucks of this material is done entirely by the 10-B and for considerable periods, is kept going day and night. The method used for illuminating night work is interesting.

Due partly to the fact that there are several places from which to draw backfill, it was not considered economical to install permanent electrical illumination at each. A better scheme, evolved by P. Bennett, chief electrician, was to equip the 10-B for developing its own light. This was done by installing on the front of the machine, two 2,500 lumen, 6.6 amp. street-type lamps connected in series across the 24-volt battery and using 16-inch mogul reflector sockets, and cabtire cable. The lamps are supported by 1¼-inch pipe, using uniclamp fittings.

On a recent backfilling job, using one truck, having a 100-foot haul, 100 tons of waste rock per hour were dumped into the mine. The only labor required was that of the 10-B operator and truck driver, the total cost being less than 1.5c per ton.

Steel Construction

Owing to the great distance between the cable sheave on top of one of the shaft houses, and the hoist drum, a steel tower for carrying idling sheaves to support the cables, had to be built. This tower is 65 feet high. All the components were handled by the 10-B. In this case an extension was added to the end of the homemade crane boom, so that the total reach was over 50 feet. From this point to top of tower, the lighter pieces of steel were handled by the workmen. With this abnormally long boom, it was necessary to counterbalance the 10-B by adding about 2000 pounds of steel plates to back of machine. This method of handling steel was much quicker than erecting the customary equipment. It also saved the price of a jinpole.

In closing, I wish to add that due to the compactness and easy mobiling features of the 10-B, coupled with the ingenuity of Messrs. Halverson, Smith, and Bennett of Wright-Hargreaves Mines, our 10-B has been made more versatile than any such machine the writer has ever seen. There is no telling what they will make it do next, but I am sure it will never be left idle.

● *Top: Because the Wright-Hargreaves mine is remote from regular equipment sources, ingenuity in adapting equipment to handle special problems is at a premium. The crane boom shown here, and made in the company's shops, has added to the profitable versatility of the 10-B.*

Bottom: Plank mats are fastened by chains to the end of the 14-foot dragshovel boom, and moved ahead as the machine works over the soft, swampy ground.

Confound the Colecchi

• *On Schedule 14, cemented gravel, or colecchi, was encountered, and had to be blasted. Here is a layer of it being blown to dust.*

So say the excavators along the Aqueduct, but Bucyrus-Monighan draglines go right ahead

By JOHN R. MARCY

SCHEDULES 14, 15, and 16 of the open work on the 390 mile long Metropolitan Water District Aqueduct from the Colorado River lie about 30 miles east of Indio. These three schedules are comprised of 87,574 feet of cut and cover work on which the Thompson-Starrett Company, Inc., of Los Angeles is engaged.

In all the three schedules call for approximately 3,000,000 yards of excavation and 2,000,000 yards of backfill. 345,000 cubic yards of concrete will be used for the conduit.

Schedule 14 is 32,366 feet long, including conduit and siphon, and the contract price was $926,961. Schedule 15 is 35,849 feet long, at $1,028,047. Schedule 16, contracted for $814,921, is 19,359 feet long.

Work on Schedule 16 has not yet begun, but 32,366 running feet, or 1,081,000 yards of Schedule 14 had been excavated by June 1, with 30,216 feet of conduit laid, and 27,400 feet of backfill completed. On Schedule 15, 450 feet had been excavated with 4000 feet of invert concrete laid. All three schedules are alike in that they call for conduit with short lengths of siphon.

Rodney Smith is Resident Engineer in charge of the entire job with Assistant Superintendent William Hayes in charge of excavation. About 400 men make up the various crews on the job.

Gravel and Rock

The composition of the desert floor here is loose gravel and a few small boulders and rock. It is estimated that in all about 180,000 cubic yards of rock will be excavated. Through a small portion of this section runs substrata of conglomerate, or cemented gravel, too hard to be handled without blasting. It is, according to Assistant Superintendent Hayes, the hardest and most difficult material to handle that he has encountered.

• *On early concreting, pouring was handled with one of the 5-W draglines. The method now in use involves a belt conveyor, and is described in the article.*

This "colecchi," as it is called, occurred practically all on the westerly end of Schedule 14, and there is no way of determining how much more will be encountered. Because of it a considerable part of yardage excavated on Schedule 14 had to be blasted. Drill rigs were used for this work. The strata are thick, so that holes can be sunk to the necessary depth by this method. Black powder was used.

Two draglines are being used on this job, both Bucyrus-Monighan 5-W's, powered with 250 h.p. Diesel engines. These two machines were shipped in and assembled about the middle of February, 1935, and have been in constant use on this job since that time. In addition to these there is also a 371 Marion Diesel crane and a 2-yard Lima dragline.

At present all the excavating is being handled by one of the Bucyrus-Monighans which is equipped with an 80 foot boom. Its big dipper swings along with the regularity and precision of clockwork, piling the dirt in a great elongated hill. It is being operated in two eight hour shifts, 7:30 A.M. to 3:00 P.M., and from 4:00 P.M. to 12:30 A.M., with three men on each shift. Because of the distance from towns, the

● *A Jaeger mixer mounted on a Mack truck is shown delivering concrete to the dragline.*

men work for twelve days at a stretch and then get two days off, which gives them time to get home without rushing.

All the material from the ditch is removed with the dragline. Finish grading at the bottom of the cut is done with a 75 Caterpillar and a bulldozer aided and abetted by pick and shovel men in difficult spots.

The other 5-W Bucyrus-Monighan, a twin of the first except that it is being used with a 90 foot boom, is now doing cover work. Of the 30,216 feet of conduit that have been laid, all but 1,000 feet have been covered. Specifications call for at least three feet of cover over the conduit, and ample material for this backfill comes from the piles along the sides of the ditch. As this is loose dirt it presents no problem, and the dragline is not employed constantly at this job. Placing the sections of the steel forms at the beginning of a section of conduit or siphon is another job of the machine, and while it does not have to be done very often, it is an indispensable service.

Minor repairs are made on the job in a field shop with the usual equipment of forge, welder, bolt machine, drills, etc. The men on this Thompson-Starrett job are enthusiastic about the two big draglines, being impressed both with their efficiency and economy of operation.

Down along the excavation, the Marion crane is doing clean-up work, removing objectionable boulders from the top of the embankment road, and throwing out the small piles from the ditch. At other times it is used for various odd jobs which because of its size it is better adapted for than the heavier Bucyrus-Monighans.

Pouring the Conduit Concrete

Following the excavation come the conduit crews, progressing at the rate of 210 feet a day. Three gantrys, an invert, arch, and form, are used for the conduit. The invert is poured first. An electric powered gantry deposits the concrete at the bottom of the cut. The mix is dumped into a hopper on the top of the gantry. Tracks running crosswise of the conduit on the top of the gantry permit the concrete bucket to be rolled above the place where it is to be poured.

Behind this come the arch and form gantrys, also electrically powered, from which the concrete is poured to form the arch of the conduit. The steel forms around which the arch, or overhead part of the conduit is poured are composed of seven foot sections bolted together in 35 foot units. These are moved forward by huge hoists which, when the concrete sets, raise their gigantic burdens for the forward move and then lower them again into position for another pour. Inside forms are collapsed, moved forward by means of a traveller and raised in position.

Conduit on this schedule is 16 feet in diameter and the siphons, of which there are several short lengths, are 12 feet 4 inches, and 16 feet. An interesting fact concerning these siphons is that they are not siphons. They are pressure pipes located at a place where the water returns to its own level and they all go downward. The complete term "inverted siphon" was coined by an engineer some years ago for want

● *The first process in outside curing is wetting down the burlap covered conduit as shown here.*

● *While one of Thompson-Starrett's walking draglines is excavating the main ditch or pouring, the other handles the back fill.*

of a better one and has stuck. All siphons are reinforced with steel because of the increased pressure they must withstand. Conduit, on the other hand, is not reinforced except at overhead crossings. All conduit is constructed to withstand the weight of 30 feet of cover as a precaution against landslides or floods which at some future time might deposit additional fill over them.

Excellent Aggregate Available

Right along the side of the aqueduct is the company's aggregate plant. From nearby aggregate pits which were selected by the district, gravel is hauled in Mack trucks to the screening plant. The aggregate on this location is especially good, core tests running around 3,000, which is about 500 above the requirement. The trucks dump the gravel into a hopper from which it is carried on to a conveyor to the crusher. After being crushed it is screened, recrushed, and then stock piled with a conveyor. Other screw conveyors carry it to the mixing plant, where automatic batchers equipped with Johnston electric scales regulate the proportions of the mix with unvarying precision. Four yards is the amount of each batch, the capacity of one Jaeger transit mixer. there are nine of these, mounted on Sterling semi-trailers, with a total capacity of 36 yards. These deliver the mix to the ditch as required. Concrete is deposited on belt conveyors which run to the hoppers on the gantries. These move forward or backward, and place the concrete through doors in the steel forms to form the permanent arch, ready for the vibrators.

Cement is delivered to the batching plant by the Southern Pacific Railway, trucks drawing two cement trailers being used for the purpose. It is dumped into a hopper and carried by a screw elevator to storage bins, from which it is drawn off to the batcher as needed.

Heat Presents Curing Problems

Fourteen days are needed for curing the newly poured concrete. On the outside the conduit is first covered with burlap and thoroughly soaked with water. Then two coats of coal tar cut-back curing compound are applied, followed by two coats of whitewash to deflect the heat. In a region where temperatures run around 120 degrees in the shade, this latter is an important provision. It reduces the temperature of the conduit from 40 to 50 degrees. Aluminum paint has been found to be even more effective, but it is more expensive and not necessary.

Inside the conduit, where curing compound cannot be used on account of the deadly fumes it gives off, a sprinkler system is set up. An interesting development here was the discovery that a fog spray, desired because it took less water, would not create a sweat on the concrete. This was because of the heat and the lack of humidity in the atmosphere. A direct water spray therefore had to be used constantly over a 14 day period.

Re-using the Water

Since water is precious on the desert, as much is conserved as possible. By means of bulkheads which prevent loss of humidity and by running the used water through a filter and then back through the sprinklers, it is estimated that from 60 to 70 per cent of the water is recovered for further use.

The inside of the finished conduit is as smooth to the touch as polished granite, and it is just about that. Every lump and seam is smoothed with air grinders so that just as little friction as possible is effected. Friction appreciably slows down the flow of water, and that is the reason for the care exercised here. When it is all ground and pointed it is pronounced finished, and another section of the world's greatest aqueduct is ready for human service.

Testing Placer Dredging Areas in the Appalachians

By **FREDERICK C. FEARING**

Consulting Mining Engineer

ENGINEERING investigations of gold placer areas in the Southeastern States, with a view to subsequent dredging operations, present some unusual problems. In this area, whence came the principal gold output of the United States prior to 1849, we have the following set of "idealized" conditions:

1. Depth of dredging ground, up to 25 feet and, locally, at times considerably deeper. Ground-water is generally close to the surface—from one to six or seven feet.

2. Sequence of material is somewhat as follows: Surface to 3 or 4 feet consists of soil, usually a clay-loam but often quite sandy locally. This is followed by a mixed sand and clay, frequently traversed by water-bearing sand "veins" and by thin seams of hardpan. Beneath this, there is likely to be from a half a foot to two or three feet of clay in the secondary valleys, with more or less sand, which rests upon coarse sand and fine gravel that grades sharply into the coarse deposit on bed-rock. These basement stream gravels may be from half a foot to three or four feet in thickness and carry from 70 to 90 per cent of total values. They generally rest upon highly kaolinized pre-Cambrian formations usually displaying a markedly schistose structure.

Editor's Note: **This article describes actual testing operations. For obvious reasons, we are unable to divulge the exact location and the people for whom the work was done. The article is published here because of the excellence with which it describes an interesting technique for testing. Mr. Fearing is well qualified to handle his subject, with a background of 26 years' experience, including work in Alaska, Canada, Montana and the Southern States; on tin as well as gold placers, and on both worked-over and virgin ground.**

3. Generally speaking, and contrary to traditional belief, clay of such a nature as to cause operating difficulties in a modern dredge is unlikely to be encountered in the major stream valleys. If it occurs at all, it is more apt to be present in the secondary valleys. These bottom areas to which I refer are true stream placers, made up of true detrital remains, and are not to be confused with the "quasi-placers" or so-called "saprolites," where sticky clay in large amounts becomes as problem.

4. Generally speaking, and again contrary to traditional beliefs, the gold of the true stream placers is not difficult to recover, being granular, as opposed to the usually flaky gold of the saprolites. Furthermore, while the gold of the region as a whole would be classed by placer miners as medium fine to fine in point of size, that of the stream placers is much coarser as compared with the very fine to flour-like gold, so often encountered in the saprolites. It is the latter type that is so difficult to save, and not the former.

5. Bedrock gravel would also be generally classed as fine, the coarser sizes ranging from 6″ to 10″, with pieces 11″ to 12″ comparatively infrequent and anything over 16″ to a rarity. It should not be inferred from this statement that boulders do not exist in the South, for they most certainly do; but their occurrence is apt to be very local on any given stream, or else confined to certain particular valleys. They do not exist in a regional sense.

6. The nature of the bedrock itself is unique. Throughout nearly all the areas of potentially important dredging ground, it is a pre-Cambrian, highly altered crystalline schist or gneiss. So complete has been the kaolization that it may be truthfully said that the bedrock gravel is now resting on a material having all the physical qualities of a mass of putty. A man standing on bedrock often sinks several inches into this plastic material and the gravel itself invariably shows that it has slowly sunk into it as much as six inches to over a foot. Still, it retains, perfectly preserved, its original schistose appearance. This condition of intense kaolinization may be expected to exist to a score of feet in depth. It has been officially reported in some cases as persisting for 100 ft. to an ever decreasing degree, and in one instance for 150 feet.

7. Below the water table,

Fig. 1.—Lowering drill mast prior to moving over rough ground to next test hole.

Fig. 2. —The Hayward orange-peel bucket comes up through the 16-inch casing with a load. This one happened to be water.

water conditions are highly variable. This is due to the random sand-veins that act as pipes, and to the seams of hardpan. In one place a shaft may be taken to bedrock, if the lagging is closely and skillfully driven, and sound results obtained; whereas but a short distance away another pit presents such difficulties from water bursting up through the bottom, runny ground, etc. that it either has to be abandoned before completion or the results discarded.

To sum up: Although the conditions enumerated are about as ideal from a dredging standpoint as one is ever likely to find, they present real difficulties to the engineer called upon to prove up or report upon properties in the region. In order to appreciate these problems better it is advisable to sketch briefly the reasons why the "usual" methods fell down before going on to describe the technique finally adopted in this investigation:

Testing by Means of Shafts

In view of the runny conditions and high water-pressures frequently encountered, the fact had to be faced that if the bulk excavation was to be taken as the sample there was no way of insuring it against mechanical salting, irrespective of whether the sump could be kept under control by powerful pumps to permit the shaft to be completed at all, or not. A number of different attempts proved conclusively that lagging could not be kept far enough ahead of excavation to guard to any adequate degree against extraneous gold being carried into the sample by the continual inrush of water. By the time the lagging could be driven into the soft bedrock and a water-seal established thereby, the harm would have been done. If, on the other hand, the shaft was put down in order to follow with an accurate channel sample from one or more of the walls, the same set of conditions operated to prevent the taking of any sample whose integrity could be guaranteed. Finally, the sinking of shafts under such handicaps, regardless of how large and skillful a staff was in charge, or how much equipment was brought to bear, could not fail to be extremely slow, very costly, and the final results decidedly questionable. It became apparent that some method must be used that could be operated with certainty in every case.

Testing with the Placer Drill

Even with a 6 inch drill it was immediately apparent that two major defects would develop under the conditions cited:

(a) These drills excavate from within the casing by chopping the gravel into particles small enough to be handled by the bailer. Unless this is done there is no way of excavating at all—except perhaps with fishing tools to get out the larger pieces, up to say 3½" to 4", which is of course a tedious and costly undertaking. Furthermore, these drills are not suited for maintaining an unexcavated core of 1½' to 2' above the cutting edge of the casing. This, however, might have been obviated through certain operating methods and the citation passed over, had it not been for the second, and by far the more serious, defect.

(b) When either the casing or the drilling tools encountered the top of the bedrock gravel, an entirely new set of conditions had to be overcome. It was found that the casing invariably picked up a particle too large for it to "straddle." Because of the putty-like nature of the bedrock there is no adequate "anvil" to support the overlying gravel under the impact of either the casing or the drill tools. Once the former picks up such a plug it proceeds to carry it on down, no sample whatsoever being taken in the interim.

If an attempt be made to break the chunk with the drill tools, the chances are very high that the only result will be to hammer it on downward indefinitely. In fact, there does not seem to be any limit to this. In one case, after, putting in some small steel shot as tell-tales, drilling was carried over 6 ft. into bedrock with only a little over half the shot recovered, and pannings still showing

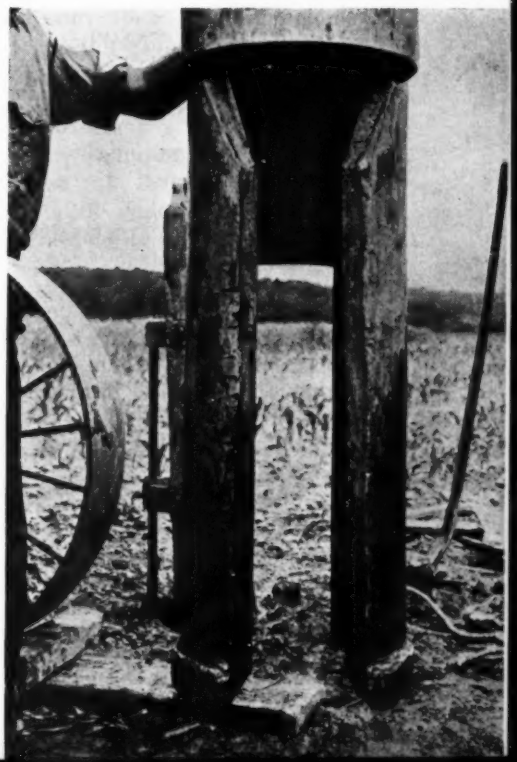


Fig. 3. —Heavy, two-bladed placer bit, used where the going was extra hard. Note the stellited cutting edges.

Fig. 4—This four-bladed placer bit was able to handle most of the work. Stellited cutting edges were used on this, as well as the heavier bit.

colors. In short, the ordinary type of placer drill cannot be depended on to bring an accurate sample after bedrock gravel has been reached, nor is it very much better than a timbered shaft in its ability to prevent mechanical salting.

The Method Selected Involved the Following Abilities

1. To sink casing of sufficient diameter to "straddle" several of the general run of larger particles at one time.
2. Casing must be easily driven, until sealed into bedrock, meanwhile maintaining an unexcavated plug for at least 2 ft. above the shoe.
3. Excavation must be by some positive mechanical means able to handle everything, from fines to the largest particles, with almost equal certainty and dispatch, and at the same time necessitate the use of the sucking action of a bailer as little as possible.
4. The rig must be readily mobile.
5. The rig must be the fastest acting and most rapid in the pulling of casing that the market provides, and as far as possible must be standard, with all parts carried in stock.

Equipment Selected

Drill Rig. A No. 33-P Bucyrus-Armstrong rig, mounted on wheels. (Fig. 1). This mounting proved to be a mistake. The machine should have been No. 26-P on caterpillars. The former proved to be unstable when moving over uneven ground, and it bogged down far too readily. To prevent the machine from upsetting, it was always necessary to lower the mast to the half-way point before moving as little as 50 ft. and then to raise it again —a process that would use up anywhere from 20 to 30 minutes every drill cycle. Also, in a farming community during the planting and harvesting season, it was at times difficult to obtain mules for the longer moves when wanted. All of these drawbacks would have been overcome or greatly reduced by a "cat" mounted rig and the number of holes sunk per unit of time considerably increased.

The drill mentioned was selected not only because of its general ruggedness and ability to stand a lot of punishment, but particularly because of its unique shock-absorbing device for the head sheave of the main wire line. This enables the machine to pull casing from such depths as were likely to be encountered faster than any other device that was looked into, and it also appeared to have influenced the very rapid rate at which casing was invariably put down. Subsequent experience proved that the choice was a wise one for the particular type of work in question.

Casing

16-inch diameter extra heavy pipe was selected, consisting of one 10 ft. length and five 5 ft. lengths. An inspection of the largest particles of gravel ever taken from previous operations in the neighborhood was at the bottom of this decision, as it was desired to be able to "straddle" several of these larger chunks at one time without danger of their jamming inside the casing. This size proved in practice to be larger than was necessary, for out of nearly 200 holes only once was a piece of gravel encountered that could not have been handled with ease in a 12″ pipe. The main drawback to the 16″ was the cumbersome weight of it—particularly the weight and awkwardness of the wrenches needed to assemble and unscrew the sections. This was another item that consumed more time than was necessary. Some idea of the size of the 16″ casing may be had from Fig. 2.

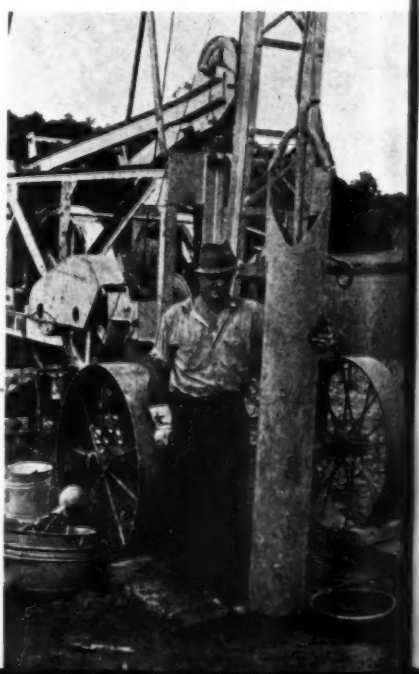
In the future 12″ pipe would be recommended. It is amply large to meet the specifications called for by the conditions obtaining in the region and it is much less awkward and the tools much more easily used.

Two cutting shoes were ordered, but it should be of interest to learn that the spare was never needed. After sinking close to 3,000 ft. of hole the original casing shoe was almost as sharp and free from nicks as when it was first placed in service.

Tool Stems

Ideally, two placer-type stems should be provided—one for semi-permanent attachment to each of the two bits used. This is to avoid the time-consuming job of unscrewing the stem in order to

Fig. 5—Running on the sand line, this special bailer shared the task of bringing up the samples with the orange-peel bucket.



switch bits, which requires combersome and heavy stem wrenches. These latter should be what is known as the "light" pattern and not the "heavy," as the former are plenty strong. With the wheel-mounted rig the extra weight of the second stem was a transportation item to be avoided and only one was provided. Had a "cat" rig been used this extra weight would not have been a deterring factor.

Drilling Tools

Bits for 16-inch casing were two in number. One of these was a heavy placer-type bit of the regulation two-bladed pattern, as shown in Fig. 3. It was employed only in very tough ground and then only in the upper two-thirds of the hole. The bit that was the day-in and day-out standby was a much lighter bit, also of placer type, but having four blades, as illustrated in Fig. 4. This tool was intended to ream out a groove close to the wall of the casing, leaving a central dome-like mound, or core. It will be noted that the inner edges of the blades have a decided upward bevel, which assists in forcing material away from the casing, toward the center of the hole.

Excavating Tools

These consisted of a Hayward orange-peel bucket, and a special 10″x8′ bailer. The former is shown in action in Fig. 2 and the latter in Fig. 5. The bailer was specially designed for the smallest practicable intake lift, from top of gravel to valve opening, to have stream-lined intake passages and positive bottom dump. It was intended that the bailer be used only on fines, and for final mopping up the bottom of the completed holes, after the entire interior of the casing had been hosed down. For the work specified the bailer proved efficient, although it was not used nearly as much as had been expected in the beginning.

The remarkable all-around efficiency of the orange-peel bucket turned out to be one of the high lights of operation. It came to be used more and more and the bailer less and less. In fact, it took the place of the bailer where only small amounts of water had to be handled, and it took care of everything encountered—water, sand, clay, gravel and large chunks—up to a small boulder 19 inches long x10″x12″ which was removed intact. The smaller bit, which reamed a groove around the periphery of the hole, greatly facilitated the efficient action of the orange-peel by preparing a dome-shaped bit of ground for the tines of the bucket to close upon.

Both the bucket and the bailer were operated from the sandline, the latter being terminated by a snatch link, but in the case of the bucket the lowering was done by the rig whereas the hoisting was done manually. In the absence of arrangements for operating both bucket ropes from the rig, this proved to be the most efficient of all possible combinations tried out.

Excavating Efficiency

In the beginning of the work with this outfit it was a part of the regular routine, after reaching the main deposit on bedrock, to drop various sizes of small steel shot into the hole and not to cease excavating until all these had been accounted for. It gradually became apparent that if such excavation was taken regularly one foot into bedrock (with the casing sealed therein from a half to a foot further) all these test steel shot would invariably be recovered. Panning tests likewise proved that all free gold values had been removed when this procedure was followed.

Pulling Casing

This was accomplished with this type of rig in a unique manner, made possible by the shock absorber connected to the headsheave of the main wire line. However, a pair of Joyce lever jacks were provided which were brought into action in possibly 20 per cent of the holes sunk during the trying winter months. After that they were used far less. In no case were they resorted to for more than getting the casing under way, and in general all they had to do was to get it "sprung." The pulling operation, shown in Figures 6 and 7, was as follows: Casing elevators were

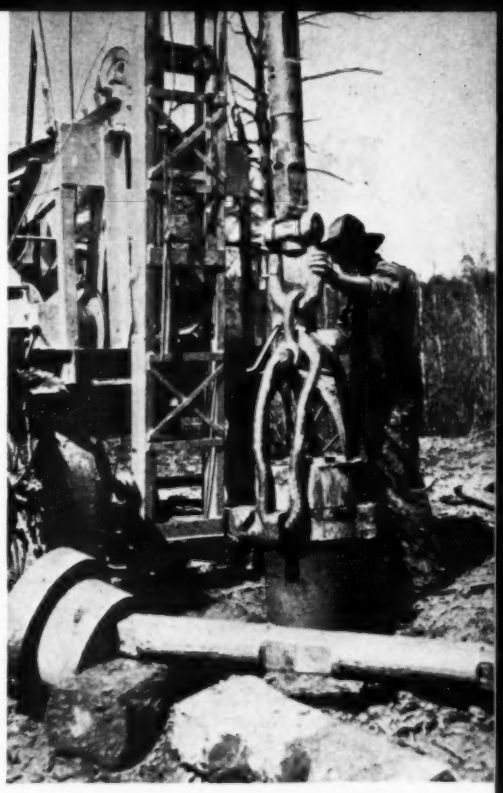


Fig. 6—Casing elevators, attached to wire line, pulled the pipe—entirely without other assistance.

placed around the pipe, and were free to slide up and down thereon until stopped by a flange. The elevator slings were then connected through a swivel shackle to a short stem and this in turn connected to the main wire line. The drilling motion of the rig then imparted a series of heavy upward blows to the lower part of one of the flanges. The speed, strokes and intensity of these blows was under the complete control of the operator. Each of these blows terminated, at the end of the upward stroke, in a powerful pulling action, due to the fact that the shock absorber was then under heavy compression. Once the casing was "sprung" its removal followed with ease. Fifteen to twenty minutes usually sufficed for the operation in the case of a 20 ft. hole.

Quick-Change Links

These are the only important items of rigging that remain to be described. Prior to their installation, each change of tools involved laying the one in use on the ground and then disconnecting from the wire line by means of the regulation stem wrenches.

(Continued on page 488)

EXCAVATING ENGINEER
FOUNDED 1905

A Monthly Publication Devoted to Excavating and Allied Subjects

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F. O. WYSE
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ARNOLD ANDREWS
Editor

D. B. REED, JR.
Assistant Editor

A. R. TOFTE
Assistant Editor

E. M. HEUSTON
Advertising Manager

How Long Can We Do It?

ON JULY 1, 1936 the Federal Government entered its seventh fiscal year of deficit financing. On December 31, 1930 the gross debt was only $16,026,000,000. On July 1 of this year it amounted to $33,779,000,000. And this compares with the wartime peak of $26,597,000,000 reached on August 31, 1919; the present debt is $7,182,000,000 higher than the previous, all-time high point.

During the Federal fiscal year ended June 30, 1936, our National Government was spending $2.10 for every dollar taken in. Total expenditure less the funds used for public debt retirement and tax refunds amounted, during the last fiscal year to $8,627,400,000 while total Federal Revenues for the same period of time amounted to $4,116,000,000.

The question of how long such a trend can be continued is not nearly of as great importance as the question "Why continue it?". The fear generated among thinking persons by such a widely unbalanced budget hangs like an ominous cloud over economic recovery. Today, the amount of economic recovery enjoyed by the United States is far behind the amount of recovery enjoyed by many other nations. Nevertheless, the great reservoirs of demand that have built up during the last six years have resulted in an improvement of business which leave few, if any, logical reasons for continuing a policy which will lead us inevitably to economic maladjustments that might easily make the difficulty of the last six years seem mild by comparison.

Even if it is admitted that the tendency toward extreme deflation during the years 1931 to 1933 made the policy of excess governmental spending desirable as tending to counteract deflation by inflationary measures, there is certainly no need for a continuance of the practice at the present time. The stability of our entire credit and financial structure rests on a balanced Federal budget. Genuine economic recovery will be impossible as long as governmental expenditures exceed income by the huge deficits that have been piling up in recent years.

Insistence by tax payers (and that includes all of us) that further deficits be completely eliminated and a policy of debt reduction be undertaken, is not a matter of asking for relief from present taxes so much as it is a demand that our government financing be placed on a basis that will insure future security, instead of future insecurity.

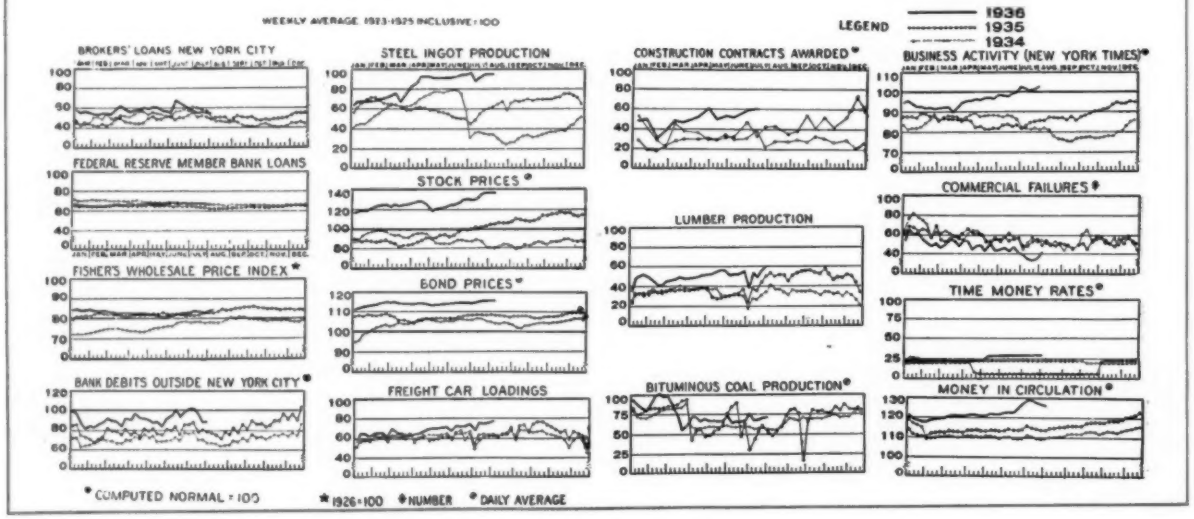
Construction Advance Continued in July

CONSTRUCTION work started in the 37 states east of the Rocky Mountains during July was larger in volume than was reported for any other month since June 1931, according to F. W. Dodge Corporation. The July total, which incidentally was larger than for any other July since 1930, amounted to $294,833,800 and compares with $233,054,600 for June and with only $159,257,500 for July, 1935.

Of the July, 1936 total, $72,093,600 was for residential building; $96,125,200 for non-residential buildings of all descriptions; and $126,615,000 for civil engineering jobs of all types.

The July figure for residential building compares with $73,604,600 for this class of work in June and $48,394,800 for July of last year. For non-residential building the June volume was $79,078,900 while the July 1935 non-residential building figure totaled $56,969,100. The June figure for civil engineering projects of every description amounted to $80,371,100 while the total for

WEEKLY BUSINESS INDICATORS



July 1935 amounted to only $53,893,600.

Total construction work started in the 37 eastern states during the first seven months of 1936 amounted to $1,532,564,500 as against only $855,764,300 for the corresponding seven months of 1935.

Western Old Timer

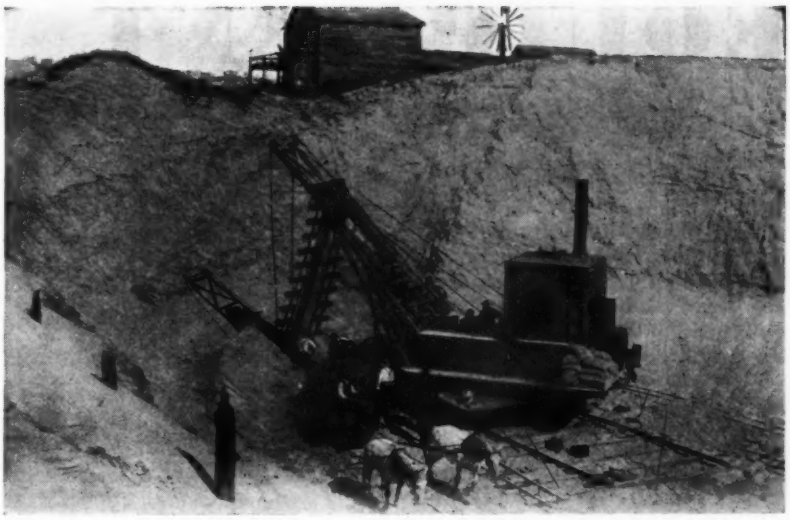
When we think of the early development of power shovels, we naturally think of the eastern and mid-western sections of the country; the former being the scene of the invention, and the later of the growth of today's large manufacturers. However, shovels were manufactured and used on the West Coast in the early days, as is indicated by this letter from H. L. Livingston of the Bucyrus-Erie Company, San Francisco office.

"I have read with considerable interest the article covering old time steam shovels and with this in mind, I am attaching a picture, together with some information about one of the pioneer dirt-moving machines used in the early days of San Francisco. The job of these machines was to cut down the sand hills. The sand was hauled away in trains of six cars, horse-drawn, and used to fill part of the shore line of San Francisco bay.

"This machine, of which there were three originally, was built in 1892 by the old Fulton Iron Works of San Francisco.

"These shovels were of the revolving type capable of swinging throughout the full 360 degrees. The car was of heavy timber construction with a heavy plank deck. The wheels were probably spaced 12' center with a 12' track gauge. The shovel wheels had to be pinched or moved by block and tackle as the engine had no connection with the wheels. The boom consisted of two heavy timbers resting at the forward edge of the deck. There were heavy hog rods with turnbuckles to support the boom.

"Well up towards the top of the boom, the elevator spud, a heavy timber, was pivoted. The elevator was moved into the digging position by swinging the machine around by means of a worm gear from which a shaft led down to a cog pinion that meshed into a gear around the outside of the turntable. The machine had a crew of three men; two, the fireman and engineer, were kept busy at the swinging gear while the shovel was loading. The third man tended the spout. Besides the three men on the shovel there were two men always on the bank pushing the sand down with shovels.



"The engine was a vertical single cylinder center crank engine with an automatic cutoff with flywheel governor. A belt led from this engine through a boxed-in alley to a shaft at the forward end of the platform. The engine was rated at 30 HP and turned up around 250 r.p.m. The forward shaft was back geared to a second shaft from which two sprocket wheels keyed to the same shaft as the elevator sprocket.

"I have been told that this shovel averaged as much as 1,500 yards of sand per day."

Much obliged, Mr. Livingston, for the interesting letter and photograph.

Frank S. Jones

THE SUDDEN death from heart failure of Frank Jones was a great shock to his colleagues in the General Crushed Stone Company of Easton, Pennsylvania and to his many friends throughout the industry.

Following service with the field artillery during the war, Mr. Jones completed his course at Lafayette College and went with the New Jersey State Highway Department as a civil engineer. In 1922 he became a production engineer for the General Crushed Stone Company, where he soon rose to the position of superintendent of Division 1. On August 3, 1936 he was made general superintendent of the bituminous concrete division.

It was on his return from his first inspection trip of the various plants under his supervision that the heart attack occurred. He was 42 years old, and entering the period of his greatest service. His loss will be keenly felt in both business and personal fields.

Beg Your Pardon

ON our August cover and contents page it was incorrectly stated that work on the Long Valley Dam, Mono County, California, was being handled by the Los Angeles Bureau of Light and Power. The correct situation is as follows:

The Long Valley Dam in Mono County, California, is part of the Mono Basin Project of the Department of Water and Power of the City of Los Angeles, consisting of the construction of the Mono Craters Tunnel and Long Valley and Grant Lake Dams. This construction is all being done under the direct supervision of the Bureau of Water Works and Supply, H. A. Van Norman, Chief Engineer and General Manager. At a later date the Bureau of Power and Light will share in the use of the Long Valley Dam for power production, but not until the dam and entire project are completed by the Bureau of Water Works and Supply.

EQUIPMENT
You Ought to Know About

New Diesel Tractors

NEW Model "KO" and "LO" Controlled Ignition Diesel fuel tractors have been announced by Allis-Chalmers Mfg. Company. An "LO" is shown in the accompanying picture pulling a seven-yard self-loading Continental Scraper.

According to Allis-Chalmers' engineers features and improvements have been included in the new models that will enable users to get a maximum of Diesel fuel economy combined with a simplicity, smoothness and balance not found in the compression ignition type tractor.

A new type of fuel pump, a simplified injection system and new cylinder heads are a few of the improvements on the new models. The new pump is extremely simple in construction, easily accessible for inspection and adjustment, and requires no costly special tools.

Controlled Ignition is another outstanding feature of Allis-Chalmers Diesel fuel tractors. Firing takes place at exactly the proper point, assuring complete and efficient combustion and eliminating power wasting pre-ignition. Due to the fact that high compression pressures are not present in the Controlled Ignition tractor, high tension rings, specially compounded lubricating oils, excessive weight and destructive vibrations are eliminated.

Wagon Drill Mounting Announced

INGERSOLL-RAND announces a new light-weight wagon mounting for fast and powerful rock drills. It fills the gap between the large I-R drills and the hand-held Jackhammer. It will handle 20 ft. steels and will accommodate a 6-foot steel change.

The new unit has great versatility, according to the manufacturer, with a positive feed at any angle. Feed is by air-motor, with an infinite range of feed pressure from 1 to 1,000 pounds. A self-locking worm drive permits feeding the drill up to the rock exactly as with a hand-cranked drill—a distinct advance in the method of feeding drills on wagon-drill service. The new mounting provides an easier and faster method of handling the heavier drills, resulting in increased yardage with less fatigue to the operator.

The mounting can be equipped with pneumatic tires which make it much easier to move or transport.

Copies of Bulletin No. 2253, describing this new unit, may be obtained from Ingersoll-Rand, 11 Broadway, New York City.

New Flux Developed

A NEW Flux has been developed by the Alumaweld Company of America, 2442 South Park Way, Chicago, Illinois. This new Flux used in conjunction with a special, high strength solder does a job heretofore considered impossible.

With Alumaweld Flux it is now possible to make high strength permanent repairs on joints of any metals. It makes soldering twice as easy because Alumaweld Solder and Flux is applied with an ordinary soldering iron or blow torch. The soldering job is done at a low temperature but has the advantage of requiring high temperatures to melt it a second time. It works equally well on aluminum, stainless steel, die cast pot metals, cast iron, copper, brass, etc., which makes it easy to join any two different metals if desired.

Alumaweld Flux works equally well with any type of solder, however, when greater tensile strength is desired, the use of Alumaweld Solder is recommended by the manufacturer.

Alumaweld Solder has a tensile strength of 12,000 pounds which is ten times that of ordinary solder. The finished joint can be worked or machined and takes a polish over which chromium or any other plating can be applied.

Black Top Scarifier

A NEW scarifier for reworking oil treated gravel and macadam roads has been announced by the Austin-Western Road Machinery Company, of Aurora, Illinois. It consists of a thirty-one tooth unit, mounted in place of the blade and standard scarifier attachment.

The depth of cut is controlled hydraulically from the operator's platform and either end of the scarifier can be raised or lowered independently. This permits the operator to operate with all teeth horizontal with the surface or set the teeth so that the front rows barely scratch the surface, while the rear teeth carry well into the material.

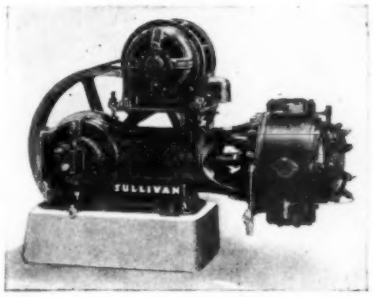
An adjustable blade set at the rear of the motor grader makes it possible to respread the material and windrow the excess in either direction. This latest development is a result of the greater weight and power of the modern motor grader, and for this reason the manufacturers offer this unit for use with the "77" Senior Dual (8 tire) Drive only.

Rigid control is assured by the use of hydraulic controls and ball and socket joints at all connecting points. The standard Austin-

Western anti-chatter device holds the circle to the draft beams and prevents all play in operation.

Stationary Compressor

THE Sullivan Machinery Company, Michigan City, Indiana announce a new stationary heavy duty air and gas compressor of the single stage, single cylinder, double acting horizontal type,



built in sizes from 10 to 50 horsepower and for pressures from 5 to 150 pounds. Advantages claimed are long life, low power cost and fully automatic operation.

Features stressed are Timken double row main bearings, replaceable cylinder liner and crosshead guide, tinned piston and crosshead, streamline long life valves.

Write for Bulletin A-13, Sullivan Machinery Company, Michigan City, Indiana.

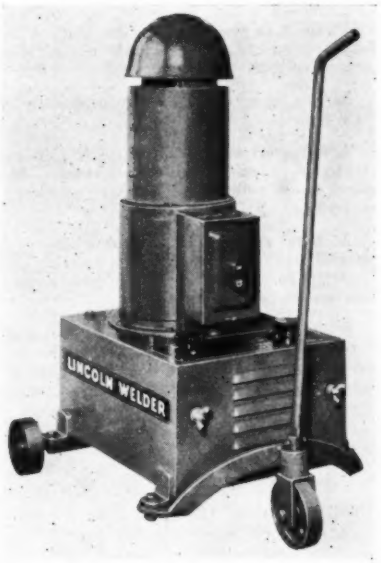
New Welding Machine Features Burn-Out-Protected Insulation

A NEW motor-driven, single operator type arc welder for general fabrication and repair work has been developed by The Lincoln Electric Company, Cleveland, Ohio. This machine, designated as the "SA-150," with a rated current range of 45 to 200 amperes, is intended for a wide variety of applications. These include sheet metal work, hard-facing of many types, pipe welding, cast iron repair, fit-up and auxiliary work in shops where heavy welding predominates, regular production welding involving steel, alloy and non-ferrous plates and shapes. It can be used with either bare or shielded arc type electrodes.

It is claimed the utility of this new welder is further broadened by the fact that, at the proper points, the machine is insulated with Class B insulation. Having no inflammable materials, such as cotton, fiber, wood or bakelite, this insulation is insured against burn outs, permitting sustained overloads without injurious effect. It is said that some shops are using it with electrodes as heavy as ¼ inch.

The welder has Dual Control of voltage and current, allowing independent adjustment of arc heat and arc penetration to suit the welding application.

The "SA-150" is powered by a "Linc-Weld" 7½ HP A.C. motor and is available for 60 cycle power circuits of 220 or 440 volts, three or two phase. Either portable or stationary models can be supplied at the lowest price ever set on



machines of this type. Net weight of stationary model is 425 lbs. The welder occupies a floor space of less than two feet square.

Hypressure Jenny

THE Homestead Valve Manufacturing Company, Coraopolis, Pennsylvania, who for several years have been manufacturing high pressure vapor spray cleaning equipment under the trade name of Hypressure Jenny, announce their entry into the low-priced cleaning equipment field with a new unit.

This new unit, to be known as Model G, is operated on the same principle as previous models. Cleaning is accomplished by means of applying through a nozzle to the surfaces to be cleaned, a combination of water vapor, hot water and cleaning chemicals, over a pressure range from 50 to 150 pounds per square inch.

The unit is fully contained, carrying water, solution and oil tanks, oil burner, vapor generator, water and solution pump, electric motor and a specially constructed vapor hose with a variety of shaped nozzles.

Vapor pressure is developed by means of a vertical-spiral-parallel-coil type vapor generator, and is controlled by an automatic pressure control switch. The vaporizing oil burning system burns standard kerosene or light furnace oil. Pilot flame is obtained by manual ignition, but is retained automatically after starting.

Both temperature and pressure are held within narrow limits of variation. Safety valve and full nozzle control give the operator absolute command of the spray and eliminate all danger of damage to the generator or operator, it is claimed.

A saturation selector enables the operator to change the spray and have a wetter or dryer vapor as needed to obtain the proper operating effect. Paint thus may be stripped by using very hot water containing a strong alkali; or by adjusting the spray and pressure, tar or very heavy grease may be blasted off.

Model G Jenny is made in both stationary and portable types. The stationary unit is mounted on a platform with legs which allow it to be raised several inches above the floor, also suitable means are provided for bolting the platform to the floor or other surface on which it is to be set up. The portable unit is mounted on a truck with 10-in. diameter semi-steel roller bearing wheels, 2½ in. wide. Solid rubber-tired wheels are also provided where needed.

Field Notes

Suction Hints

MOST of the troubles found in pumping are due to faults in the suction line. This is particularly true of the centrifugal pump which must be full of water (primed) in order to deliver its full capacity of water. While some centrifugal pumps will work with considerable air entering the suction line, every bit of air entering takes the place of so much water and the capacity is cut down, or in some cases the pump stops working entirely. It is therefore very important to have an air tight suction line wherever the pump is required to operate above the level of the supply. The suction line is under reduced pressure and any small leak will let the air enter.

Another important thing to remember is to eliminate all air pockets in the suction line. That is, there must be no point in the pipe line higher than the suction inlet to the pump. There is always some air entrained in the water and even if there is no actual leak in the line, air will accumulate in the pocket. If enough does get caught it will either go over into the pump in the form of an air slug and stop it, or it will cut down the size of the pipe to an extent that will curtail the capacity.

The air pocket shown in the photograph is apparent to anyone, and the pump while throwing a good stream has a tendency to shut down every once in awhile unless the suction hose is straightened out. A small leak in the suction is more serious than is generally realized if full efficiency is to be obtained. Air under reduced pressure, as it is in the suction line, will expand to a considerable degree and a small amount of air becomes enough in volume to cause considerable trouble. It is perfectly possible for a pump with a small leak to suck in the air, expand it in the suction line, and pump until it has a volume sufficient to cause a reduction in capacity, and then compress it again to the original volume or less at the discharge. This is the reason that it is not always possible to tell whether a pump is sucking air by a simple inspection of the discharge. In using a centrifugal pump for the greatest efficiency the following points should be kept in mind:

1. Keep the suction line as short as possible, the pump as close to the supply as practical.

2. Avoid bends as much as possible and see to it that there is no chance of forming an air pocket which might later cause trouble.

3. See that the suction line is tight (air tight).

4. Support the suction line so that no strain is carried on the pump. This may save a broken casting or some worn bearings.

5. The suction line should have a short length of straight pipe next to the suction in order to avoid eddies and consequent pump losses.

6. See that the suction pipe is properly submerged. There should be no eddies or whirl pools near the suction line entrance when the pump is working.

If these points are kept in mind when making even a temporary set up such as is illustrated, there should be no trouble due to low capacity or stoppage of pumping.

—K. B. Humphrey.

Strong and Easily Constructed Fastening or Dead End for Small Stiff Tension Springs

THE DEAD END of many small but strong stiff tension springs must often be located on some wood surface where it is necessary to firmly and securely fasten it as a matter of durability and safety.

Use two common washers and a spring cotter as shown. Bend the washers over a bit off center forming two upright lugs. In the foot or larger portion of the washers drill holes for several wood screws as large as the area will allow, but

at least two. Drill a hole through both upright lugs or perpendicular parts for a cotter key, using one as large as possible. This affords a fastening constructed to withstand the spring pull for a very long time. The cotter key makes it easy to disconnect the spring end from time to time if necessary.

—Frank W. Bentley, Jr.

Rule of Thumb Safety

WHENEVER any material is sufficiently overstressed by overloading, it must fail and a serious injury may then result. By learning the few simple rules given here and applying them in your work, you may prevent an injury to yourself or the men with whom you work.

Safe Loads on Manila Rope, Open Hooks, Plow Steel Cable, Chain, Shackles

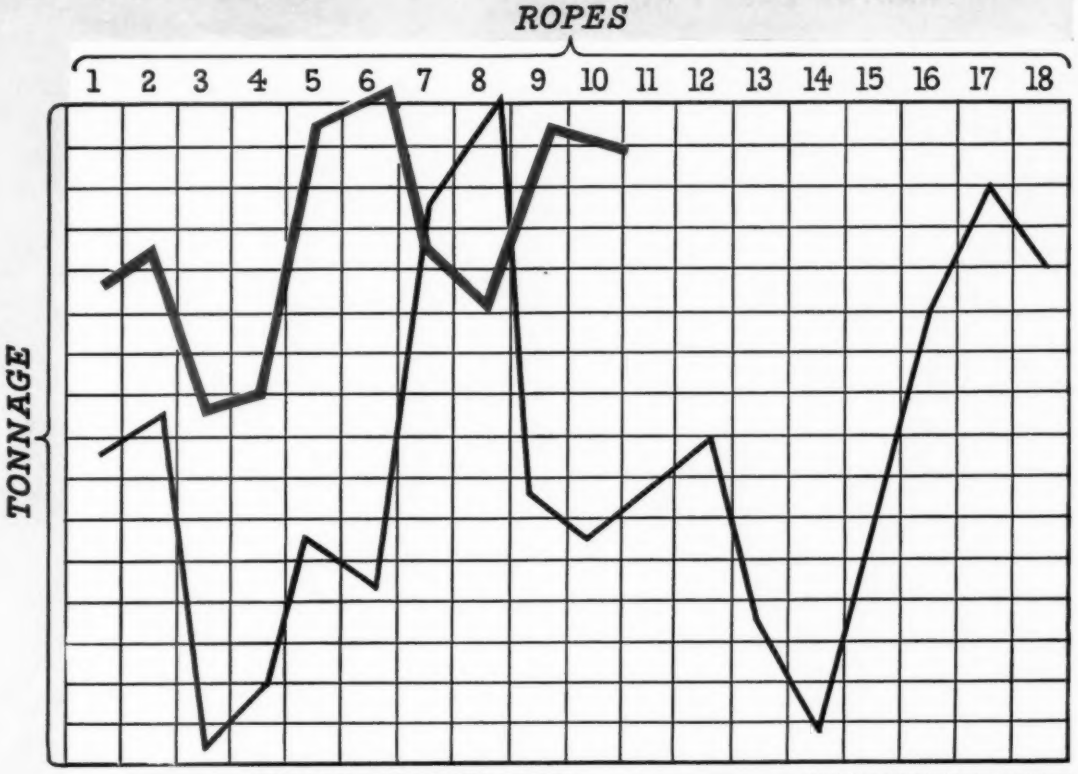
Safe load for manila rope in tons is the diameter of the rope in inches squared. Safe load for an open hook in tons is the diameter in inches squared. Safe load for plow steel cable in tons is eight times the diameter in inches squared. Safe load for chain in tons is six times the diameter in inches squared.

Safe load for shackle in tons is seven times the diameter in inches squared. Values as given above are for direct tension loads on single ropes and chains. When used in multiple, loads may be increased proportionate-

(Continued on page 471)

A study in wire rope service . . .

CONSISTENCY



● Here is a graph that visualizes the *consistency* of TRU-LAY Preformed Wire Rope service.

The chart was taken from records of a large mid-western coal mine covering 18 non-preformed wire ropes and 10 TRU-LAY Preformed wire ropes. All ropes worked under identical operating conditions; were the same size, construction, lay and grade.

The ten TRU-LAY Preformed ropes gave an average service of far greater than the 18 *non*-preformed ropes.

TRU-LAY Wire Rope in operating service invariably gives increased tonnage and is more consistent in its service because it is preformed. Preforming makes a more uniformly high quality rope—for practically every job. And TRU-LAY is preferred because it is preformed by the American Cable Company.

Specify TRU-LAY Preformed for your next rope. Let an American Cable engineer help you. He has had 12 years' experience with preformed ropes.

AMERICAN CABLE COMPANY, Inc.
Wilkes-Barre, Pennsylvania
An Associate Company of the American Chain Company, Inc.

In Business for Your Safety

GREEN SIGNIFIES SAFETY

District Offices: Atlanta, Chicago, Detroit, Denver, New York, Philadelphia, Pittsburgh, Houston, San Francisco

TRU•LAY *Preformed* Wire Rope

ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND

For your convenience in writing to American Cable Company, Inc., you will find a card bound in this issue.

VIBRATION

TRACTOR ENEMY NO. 1

It is a universal law that marching soldiers must break step while crossing a bridge—to avoid the destructive effects of VIBRATION. Unless CONTROLLED — vibration can be just as destructive in tractors.

CONTROL MAKES THE DIFFERENCE

CONTROL means lon

★ CONTROLLED *instant* STARTING
CONTROLLED INJECTION OF FUEL
CONTROLLED AIR-FUEL RATIO
CONTROLLED IGNITION

14 TO 21 HOU
PER DAY

In the construction o
new two-lane highw
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work 14 to 21 hours
day. Above is one of t
Model "L-O's" with
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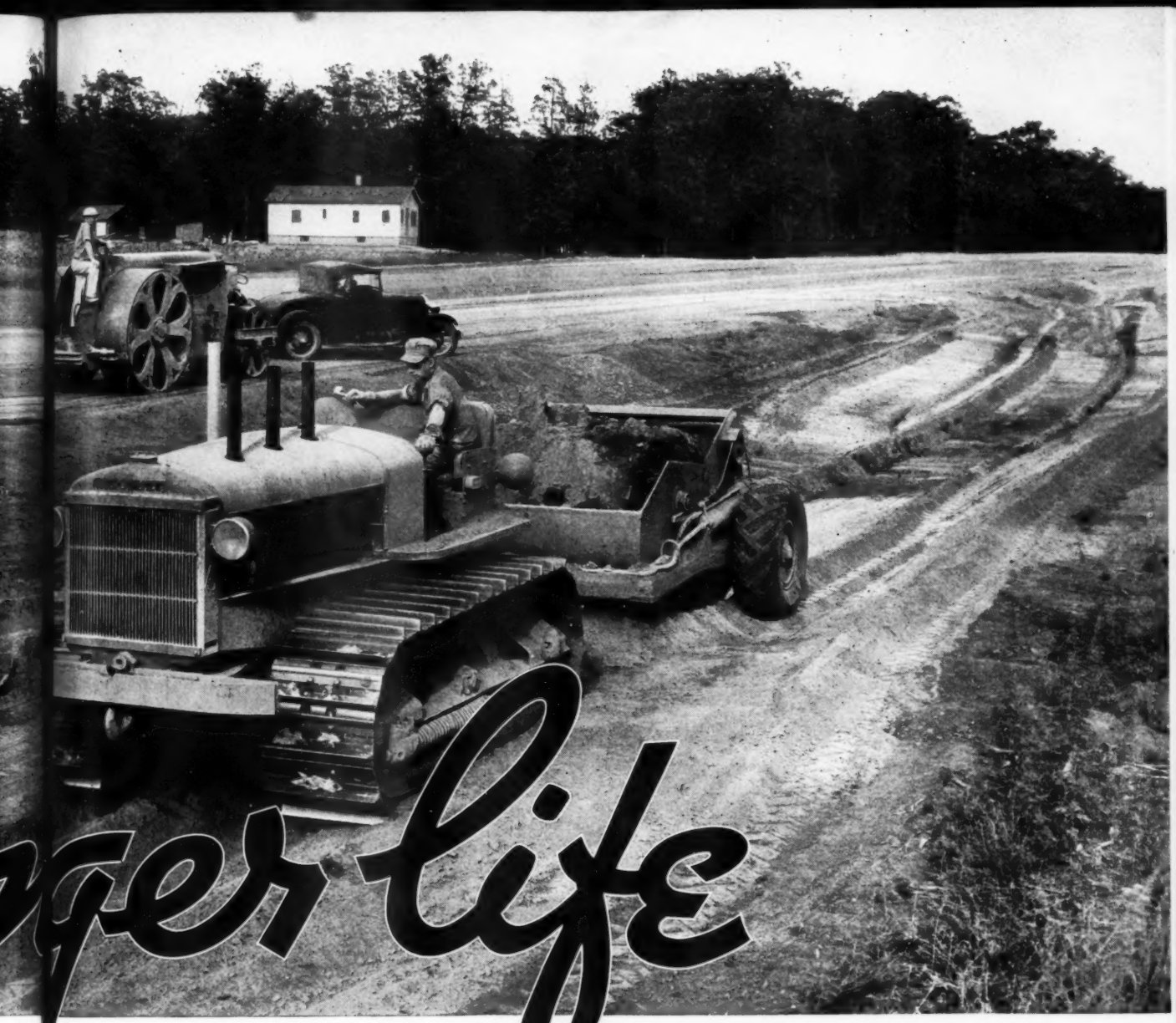
er. Below is a Mod
"K-O" leveling the grad

ALLIS
TRACTOR



ger life

It is only natural that Controlled Ignition, with its low compression pressures and freedom from destructive vibration, should mean longer tractor life. A typical owner reports that after 7,000 hours of heavy work — in severe dust, 22 hours a day — he had not even replaced the original sleeves and pistons of his first Model "K-O". In a large logging camp — under the most abusive type of work — a fleet of Model "L-O's" worked 3,500 hours and still had their original pistons, sleeves, rings, valves, steering clutches, master clutches, brake bands, main and connecting rod bearings.

Control makes the difference! Controlled Ignition enables Allis-Chalmers Oil Tractors to burn any good grade of low cost Diesel fuel oil with normal compression pressures in the combustion chamber. Thus ... abnormal stresses and strains on metals and working parts are avoided. There is no need for heavy, unbalanced construction, no special high pressure bearings, no high tension rings, no heat reservoirs in the combustion chamber, no special lubricating oil. You profit from using low cost Diesel fuel without sacrificing instant starting, balance and low upkeep. See an A-C dealer.

FACTORY BRANCH AND DEALER SERVICE EVERYWHERE

ALLIS-CHALMERS
TRACTOR DIVISION—MILWAUKEE, U. S. A.

Controlled Ignition OIL TRACTORS

Field Notes

(Continued from page 470)

ly. When ropes or chains are used in a sling, loads must be decreased depending upon the angle made by the sling with the horizontal. At 60° angle the loads should be reduced to approximately 85% of the allowable direct tension load; 45° to 70%; 30° to 50%; 20° to 34%; 15° to 25%; 10° to 18%; and 5° to 9%.

Illustration—Safe load for 1" manila rope is 1 ton. For a half inch diameter rope, it is one-half squared, or one-fourth of a ton, equal to 500 lbs. For a plow steel cable it would be eight times the above amounts. A plow steel cable sling that would lift on direct tension 8000 lbs. (2x8x½x½x2000) will only carry safely 5600 lbs. when the lines of the cable sling make an angle of 45° with the horizontal (angle *between* the sling lines is then 90°); or 2000 lbs. when the angle becomes 15° (angle between sling lines 150°).

Safe working value for lateral resistance of one nail in fir or pine. Simple rule—Eight times the pennyweight size of the nail.

Illustration—8d nail will safely transmit 64 lbs; 16d nail 128 lbs.

E. N. Goldstein in Construction Safety.

Special Tie Rods Save Time

IN setting forms for the monolithic siphon across Fan Hill Wash, on the Colorado River aqueduct, in Southern California,

an improvement on the Bulldog tie rods was developed by Mangus Hjalmerson, construction superintendent for the water district forces, which eliminated danger of leaks and saved much time in removing forms.

The method consisted of the use of a ⅞-inch bolt, threaded at each end, which is left in the wall when inside and outside cones are removed. The cones are of 1⅛-inch steel, and extend far enough into the concrete to allow for grouting when they are removed. The inside one is milled down to conical shape, and threaded inside for the ⅞-inch bolt mentioned. A square head on the back end fits against a ⅝-inch steel plate, which is welded to two 8-inch channel walers on the inside form. The outer cone is somewhat longer, with a flattened and slotted end through which a tapered steel key is driven to draw it against another plate welded to walers on the outside forms, like those on the inside. Forms were usually removable in 48 hours.

—J. C. Coyle.

Two Belt Lap Kinks

THERE is an old rule regarding the "correct way" to run belt laps which does not take into consideration the fact that on one pulley the belt slips in ONE direction and on the other pulley the slip is in the OPPOSITE direction. Slipping and creeping are always toward the TIGHT side of the belt.

Thus on the small pulley, Fig. 1, the slip will be such as to "smooth" the scarfed edge of the joint, while on the large pulley the tendency is to open the joint and cause the feather edge of the lap to roll up.

The proper rule, in a case of this kind, is: "Make the small pulley the determining factor." That is, let the small pulley do the "smoothing." The large pulley is less likely to cause opening and rolling-up of the lap.

Or, in some instances it may be possible to make use of the kink illustrated by Fig. 2. This sketch shows how, by simply giving one end of the belt a half turn, the tendency will be to "smooth" the joint on both pulleys—which is as it should be.

For wide belts on pulleys that are close together this method is

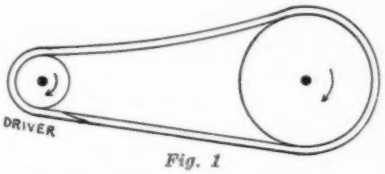


Fig. 1

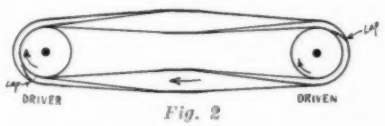


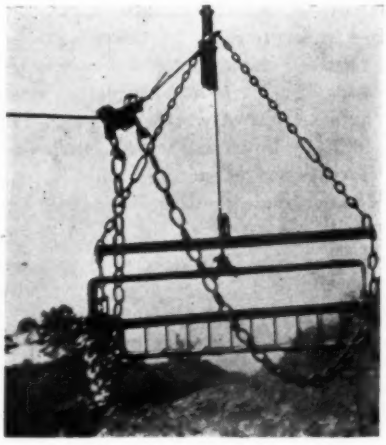
Fig. 2

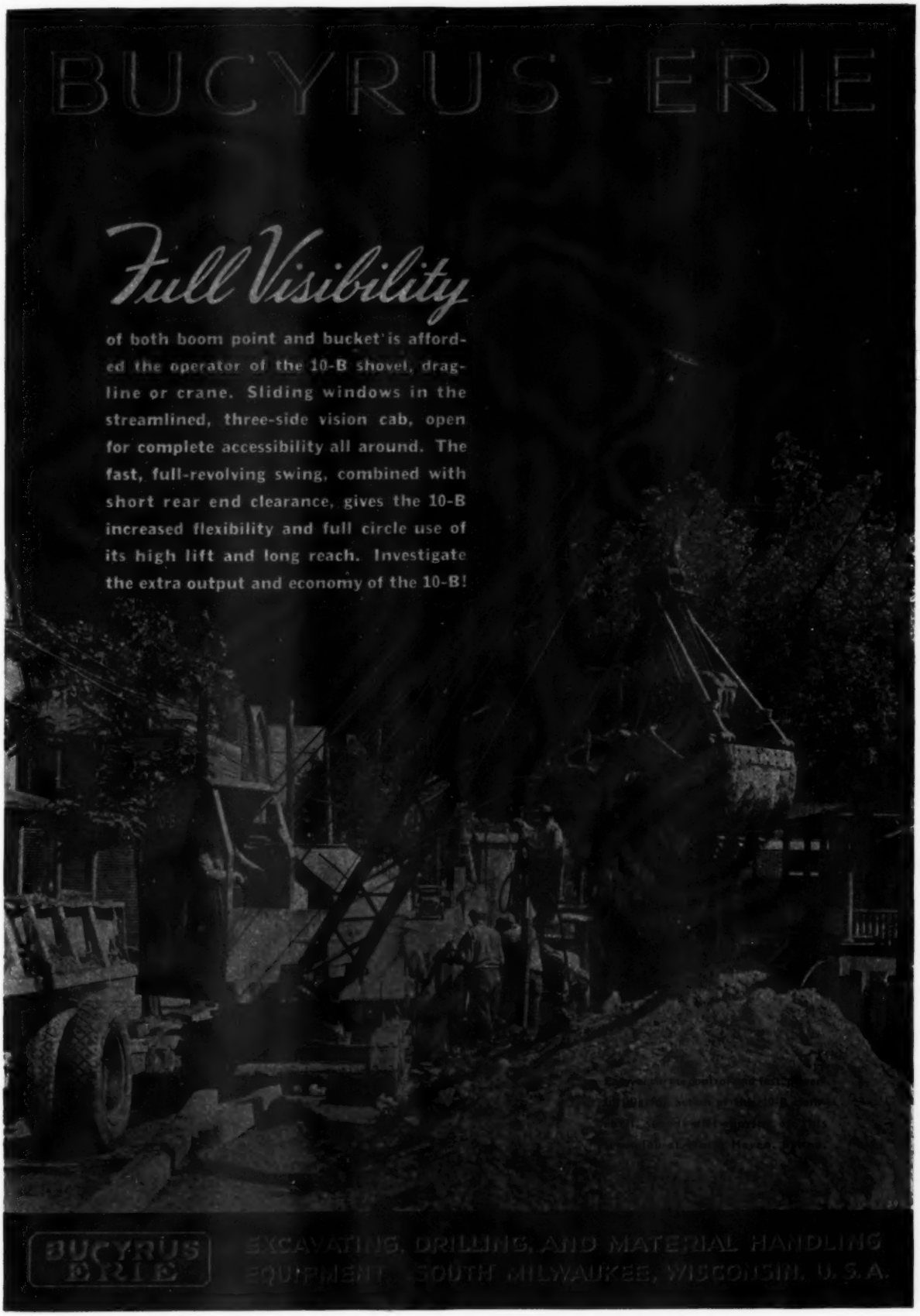
not recommended, but for narrow belts it is all right. Also it gives good results on wide belt drives with pulleys far apart.

Another advantage of a belt turned in this manner is that each pulley has its own side of the belt to work on. That is, the flesh side will always be in contact with one of the pulleys and the hair side will always contact the other pulley. Projecting belt fibres therefore are not first bent and rubbed in one direction and then in the other direction, an action that may cause rapid wear. The fibres on both sides of a single belt will be always in the same direction as the lap—a condition that is ideal. This advantage holds whether the belt is single, double, or triple, and whether it is leather or fabric.

—W. F. Schaphorst, M.E.

• *Keeping secondary canals in drainage systems free from vegetation in fertile lands in Florida is a problem. One solution has been found in the rake pictured here. Manufactured by the Vero Machine & Supply Shops, it is used on a dragline, and removes vegetation efficiently without widening the canal as regular buckets are apt to do. Photo courtesy of Hercules Record.*

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SHOTS from the Firing Line

"Freezing" Sand at Grand Coulee

RECURRING slides of sand between two outcroppings of granite have been hampering excavation in the east bank area at Grand Coulee Dam. Elimination of these slides by a frozen dam is planned, since resloping to an unusually flat angle and use of a small concrete retaining wall have failed to halt the slipping sand.

It is reported that a refrigeration plant with a rated capacity of 100 tons of ice a day will be installed. Three-inch pipes will be sunk at regular intervals above the present retaining wall. The frozen dam will be about 100 feet long, arched back against the slide area; 25 feet high; and 25 feet thick, with thickness being increased during the freezing period. It is estimated that this dam will save approximately 1,000,000 yards of excavation. Some of the water now being pumped from the flooded area will be left until the dam is complete to help the freezing.

Meanwhile, work has proceeded on the west bank, where the million-yard figure for concrete poured was recently reached.

The one millionth yard was placed without ceremony on August 14. Pouring of concrete began December 6, and in reaching the millionth yard, an average of nearly 4,000 cubic yards a day has been maintained. The present contract calls for placing a total of about 3,200,000 additional cubic yards.

The record pour made in one day to date has been more than 7,100 cubic yards. Only one mixing plant, that on the west side of the river, has been in operation up to this time. However, the east mix plant it about ready to begin its daily stint. The river has receded and the east excavation has been pumped out. The bedrock in the eastern excavation is being cleaned for the pouring of the first concrete in that area. Once the second mixing plant goes into operation, record pours can be expected immediately.

Frank A. Banks, Construction Engineer of the Bureau of Reclamation in charge at the dam, reported that work has begun on construction of two cross channel cofferdams, which will require a total of 8,000,000 board feet of lumber, preparatory to diverting the flow of the Columbia River beginning about October 1.

Forcing this great river from its ancient channel is considered the most difficult engineering feat in connection with construction of Grand Coulee Dam.

The river will be diverted westward about two hundred yards, and will flow through an opening which is being left in the western side of the dam, which is now being poured. The stream will be raised about three feet in the diversion process.

The cofferdams which will close off the central section will be built up from either end by fastening sections manufactured ashore in place. The most difficult task will be placing the last section of the first of these cofferdams. This section will be slightly wedged in shape and will form the keystone of the whole structure.

Other work in progress at present includes the demolishing of the wings of the west side cofferdams, erected of steel sheet piling, also in preparation for diversion of the river.

A total of 6,105 men are at work at the dam, the largest number to date. A total of 19,100,000 cubic yards of excavation has been recorded in construction of the dam.

• *The slide area which has been causing trouble in the east bank excavation area at Grand Coulee is shown at the left, between two outcroppings of rock. A frozen dam is planned to eliminate the slides.*

Power Generation to Start at Boulder Dam

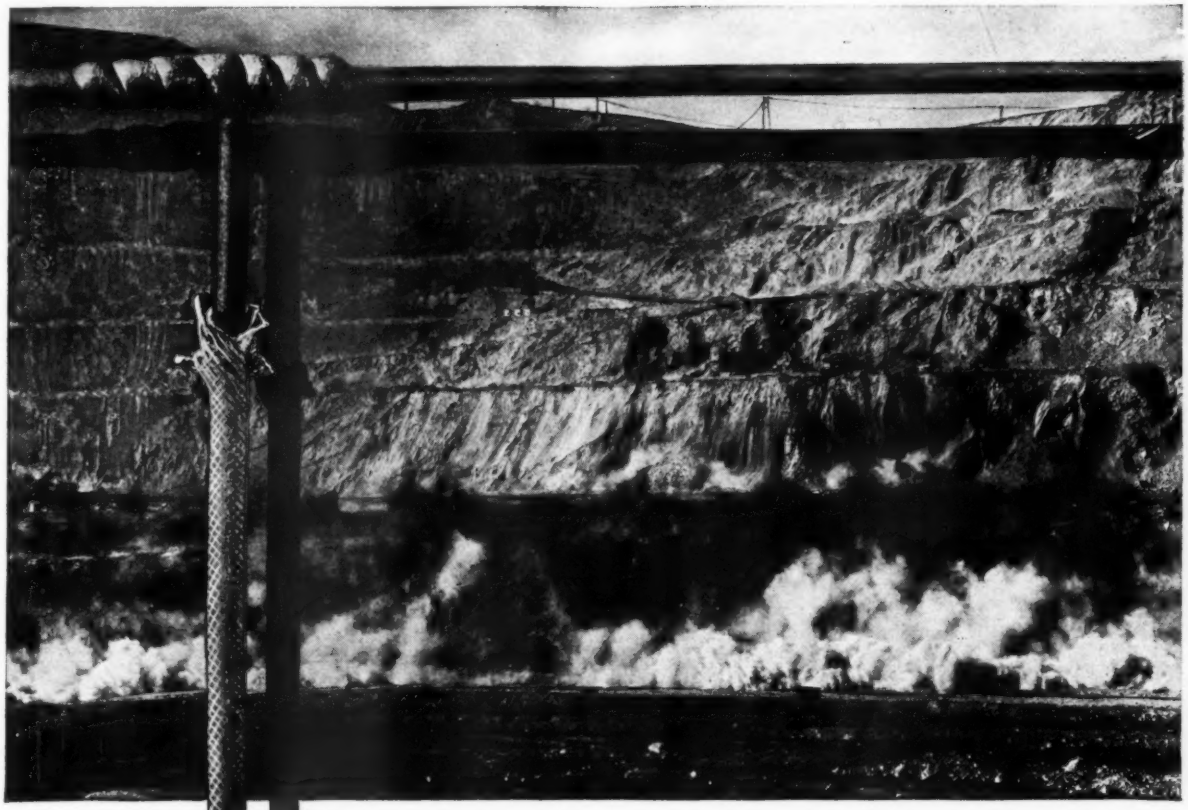
ON September 11, at the conclusion of an address to the World Power Conference in Washington, President Roosevelt will throw the switch which will start the generation of power at Boulder Dam.

In addition to turning the water into the first turbine to go into operation in the Boulder Dam power house, the President's signal, which will be given from the Speaker's platform at Constitution Hall, will open the twelve great needle valves in the canyon wall outlets below the dam, creating a spectacular waterfall thirteen feet higher than Niagara.

Six streams of water, flowing about 5,000 cu. ft. a second, will issue from either side of the Black Canyon gorge, 180 ft. above the power house tail-race. These streams will meet at midstream. Water has been by-passed through the canyon wall outlets since Boulder Dam was put into operation in 1935 but never have more than six of these valves been opened at one time and never have valves on both sides of the canyon been opened simultaneously. It is unlikely that the spectacle of the twelve valves flowing at capacity will be repeated.

National broadcast of the ceremony is expected, the broadcast to include the President's' address to the delegates to the World Power Conference, which will begin about three o'clock, and to shift quickly to the Boulder Dam power house to pick up a description of the starting of the generator and the creation of the stupendous waterfall. The broadcast also will include an interview, during which Ralph Lowry, Construction Engineer of the Bureau of Reclamation, in charge at Boulder Dam, will explain the significance of the commencement of generation of power.

In effect, two ceremonies, joined by



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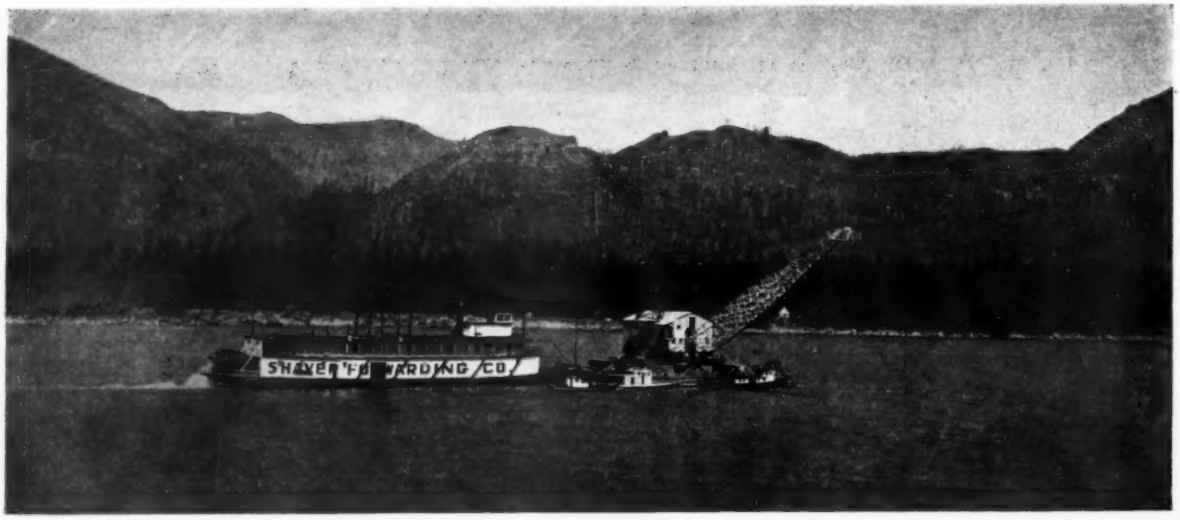


• *Machines working at Bonneville must be prepared to travel. Shown here is the Columbia Construction Company's Bucyrus-Monighan walking dragline being ferried across the Columbia River near the dam site.*

radio, will progress simultaneously. The World Power Conference will hear both the President speak and the broadcast from Boulder Dam after he has thrown the switch to start the generator. At the same time, a crowd at Boulder Dam will hear a broadcast of the President's speech and will see the huge power plant go into operation, as he throws the switch.

Industrial Safety

THE industrial accident situation is brightened by the record of the training of 73,609 persons in first-aid and mine-rescue methods during the past fiscal year by the United States Bureau of Mines. The total number of persons trained by the Bureau's Safety Division since its creation amounts to 963,197, consequently the training of the millionth man should be attained within the next few months.

While it is possible to record but a small proportion of the cases in which the training has been put to practical life-saving effect, the known saving of 60 lives as a result of the training was reported to the Bureau during the year. The saving of 665 human lives as a result of training activities has so far been reported to the Bureau and it is estimated that an average of 200 lives per year are saved through this work.

The first-aid and mine-rescue training work for the fiscal year was conducted in 489 towns in 33 states. During the year, 188 mines and plants have awarded certificates showing that 100 percent of the employees at such mines and plants had been given training. A total of 1,519 plants has been given 100 percent certificates of first aid, indicating that they have had all of their personnel given the full Bureau of Mines first-aid training course.

During the fiscal year, 844 first-aid instructors' certificates were issued, making a total of 6,543 instructors' certificates issued to date. These first-aid instructors' certificates are greatly prized, as their possession gives a preference in employment in numerous organizations both within and without the mining industry.

During the fiscal year 56 first-aid contests were held in 18 states at which the Bureau's safety men actively assisted; 908 teams involving 5,448 men participated, and almost 109,000 spectators witnessed the contest.

During the year 25 mine explosions in 8 states, 23 mine fires in 14 states, and 38 miscellaneous mine accidents were attended or given special attention. There were but 2 major disasters, and in these but 17 lives were lost. This is a far more favorable showing than the average of 17 major disasters with average life loss from them per year of 497 in the 5-year period before the Bureau of Mines was organized.

The approximately 50 persons in the field service of the Safety Division of the Bureau of Mines came into personal contact with more than 300,000 persons in the mining and allied industries during 1935.

Cotton Roads Tested in Many States

COTTON fabrics designed by workers of the Bureau of Agricultural Economics and North Carolina State College are being used in road-building experiments in 24 states under Federal-State projects to develop new and extended uses for cotton.

The cotton fabrics, distributed by the Agricultural Adjustment Administration in its program to encourage new uses of cotton will be used to re-enforce nearly 600 miles of bituminous-surfaced roads in the various states. The objective is to reduce road maintenance costs and to expand the domestic market for cotton.

The behavior of the roads will be recorded scientifically under all sorts of traffic conditions, and the question settled as to the physical and economic value of this type of road. The effort of the Bureau of Agricultural Economics has been to design a low-cost high-quality fabric for these tests. The quantity of cotton required to manufacture the materials developed by the bureau varies from 5 to 8 bales per mile of road.

The fabric is ordinarily laid over a bituminous priming coat on top of the graded and surfaced road bed. It is covered with a second bituminous coating and crushed mineral aggregate. The road is rolled, and another bituminous coating applied. Into this, a layer of "chips" is rolled.

The bureau reports that cotton fabrics have been used experimentally in bituminous road building in Texas, Louisiana, Georgia, New Jersey and Mississippi, as well as in South Carolina, but says that the area involved has been too small for the results to be conclusive.

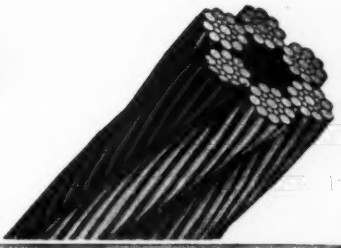
For persons interested, the bureau has prepared for free distribution a pamphlet entitled "Cotton Fabrics for Bituminous-Surfaced Roads," in which the history and present status of experiments with cotton roads are discussed, and specifications cited of the fabrics developed by the bureau.

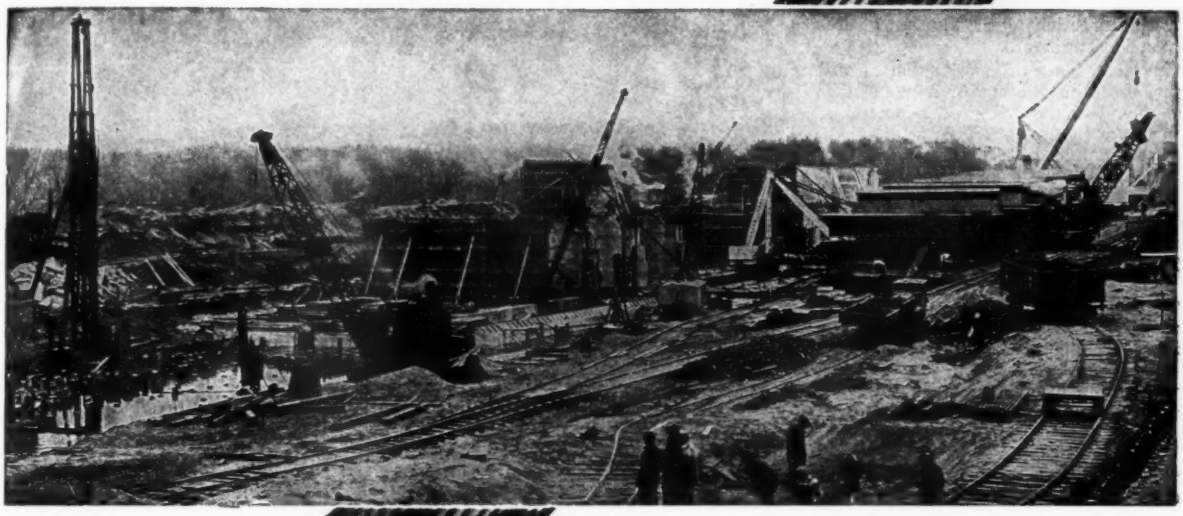
Testing for Central Valley Dam Sites

SECRETARY of the Interior Harold Ickes has announced award of the contract for drilling and excavation for investigation of the Baird dam site on Pitt River in California, a possible location of one of the dams of the Central Valley Federal Reclamation project, to Lynch Brothers, Inc., of Seattle, on their bid of $47,242.75.

The successful bid was lowest of five proposals submitted to the Bureau of

"Hercules" Red Strand Wire Rope





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Reclamation at its Sacramento, California office, July 15.

At the same time all three bids submitted for doing similar work at the Table Mountain dam site on the Sacramento River were rejected as being too high. Engineers of the Bureau of Reclamation considered these bids too high.

The Table Mountain dam site will be investigated by force account labor under the direction of the Bureau of Reclamation engineers.

Investigation of these two sites will consist of the drilling of a pattern of holes and the driving of a series of short tunnels, up to 150 feet in length, in order definitely to determine characteristics of the rock present.

The Kennett dam site on the Sacramento River, which lies betwen the Baird and Table Mountain sites, already is being investigated in this manner. Because broken rock was found on the west abutment at the Kennett site, the Bureau of Reclamation decided to make careful investigations of the Baird and Table Mountain sites in order that a construction program may be launched without undue delay. These sites might be used together in substitution for the Kennett site, if, on completion, these studies should indicate a substitution is advisable.

The State of California had made investigations of these dam site in preparing its plans for the Central Valley project, plans which have been adopted by the Bureau of Reclamation. However, the Bureau of Reclamation has found it necessary in preparing detailed plans for the dams to carry the investigations much farther than those made previously.

The contractor will be expected to commence work at the Baird dam site within ten days after being notified of the award. The force account work at Table Mountain will be begun as soon as equipment can be transported to the site.

● *Construction of Tygart Dam, near Grafton, West Virginia, necessitates relocating B & O railroad tracks. The A. Guthrie Company of St. Paul, Minnesota is handling part of the work with Caterpillar Diesels pulling Athey Forged-Trak wagons as shown here.*

Baltimore to Advertise Bids On New Tunnel

THE city of Baltimore will advertise early in September for bids on the construction of the proposed Gunpowder Falls-Montebello Tunnel connecting Lock Raven and Lake Montebello. The length of the conduit will be about 36,700 feet. Of this 34,500 feet will be in rock tunnel and 2,200 feet in open trench. The tunnel section will be 12 feet inside diameter. Reinforced concrete will line about 12,000 feet of the tunnel and pipe backed with concrete or shotcrete and lined with shotcrete. Shotcrete or concrete will line the rest of the tunnel section. In the trench section, there will be a 10 foot steel-plate pipe with a bituminous lining and a concrete casing. Bidders are advised to visit the work before submitting a bid.

Illinois Highway Program

THE Illinois Department of Public Works has announced a highway construction program, costing $37,670,000, which is an increase of more than $15,000,000 over that of 1935. Included in the new program will be 138 miles of concrete pavement, 51 miles of bituminous-surfaced gravel or stone, 137 miles of gravel or crushed-stone surfacing, 522 miles of grading, 39 large bridges, 86 railroad grade separations and 81 miles of highway landscaping. Funds for the program will be secured from the state and federal sources.

● *George M. Brewster & Son have the contract for the Jersey approach to the Midtown tunnel under the Hudson River. Contract calls for moving 225,000 yards of rock and 100,000 yards of earth, and totals $2,600,000. The company's Bucyrus-Erie 43-B loads 14-yard LaPlant-Choate dump wagons hauled by Caterpillar Diesel tractors.*

Water Conservation Plans

By H. E. Unger

IN cooperation with the National Resources Committee, the state planning boards of Minnesota, North Dakota and South Dakota have worked out a group of projects, for the purpose of conserving water in the basin on the Red River of the North. Included in the proposed work is the construction

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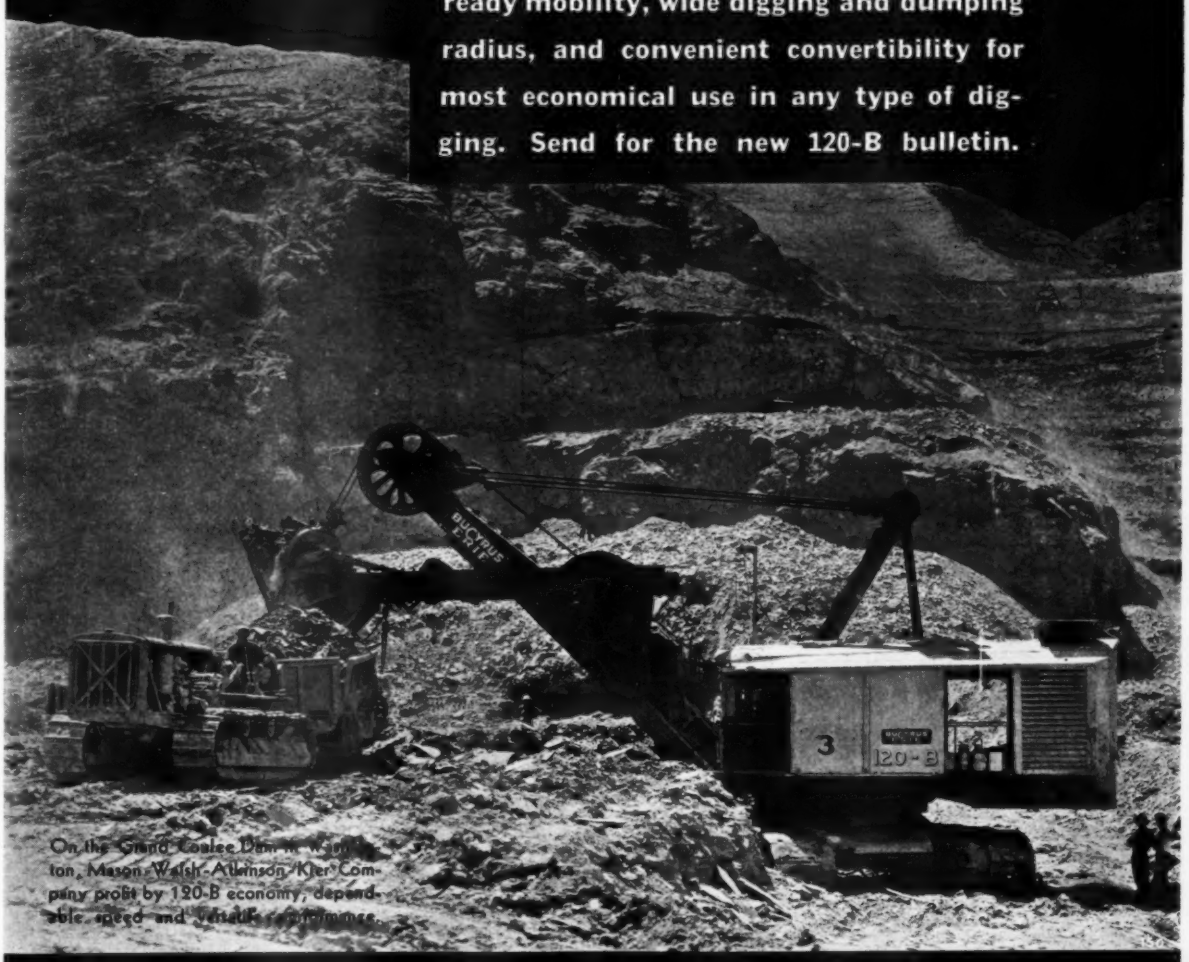

On the Grand Coulee Dam in Washington, Mason-Walsh-Atkinson-Kier Company profit by 120-B economy, dependable speed and versatile performance.

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• *The Highland Company of Louisville, Kentucky, keeps a steady stream of dirt moving on a highway job near Covington, Indiana.*

of small dams, bringing back of natural lake levels, channel improvements, flood control, reduction of stream pollution and the improvemnt of municipal and rural water supplies. The states are willing to contribute a share of the cost, according to the planning boards, who have advised the government of this cooperation. Under a unified plan of water management, they are developing a tri-state organization to operate and continue existing and proposed works. According to Secretary Ickes, this program is the first proposal of a practical kind for the development of a water conservation plan as a major safeguard against serious drought conditions.

The cost of the project will be about $10,000,000. Work is divided into two groups, that which should be started immediately, and that of lesser importance, which can be postponed. In the former group are: water conservation dams on the Ottertail and Pelican rivers, $244,000; control works for channel improvements on the Red Lake River $437,200; channel improvement on the Red River, Cheyenne and Ottertail Rivers, $355,000; flood control and game refuge reservoir on Lake Traverse-Bois des Sioux, $900,000; Blooming Valley reservoir, and Two River auxiliary channel, $1,301,000; small dams for water conservation and recreation throughout the basin, $2,358,000; sewerage and sewage treatment works throughout the basin, $2,546,000.

Equipment Distributors' Committee Meets

THE annual mid-year Executive Committee Meeting of the Associated Equipment Distributors was held July 20, 21, and 22 at the Edgewater Beach Hotel, Chicago.

While the principal business transacted pertained chiefly to Association matters, considerable time was given during the first day's session by manufacturers and distributors present to listening to the Honorable Robert E. Freer, member of The Federal Trade Commission, whose subject was "The Federal Trade Commission's Relation to Business Problems." Mr. Freer's talk was very interesting and, in the interim between the Executive Commitee Meeting and the Association's annual meeting to be held in January, 1937, further study will be made of what the Federal Trade Commission has to offer in aiding in solving some of the major problems of industry, with the idea of possibly making some recommendation for the consideration of the membership at the January meeting. All of the Association's committees reported progress in their work for the six month period then ending. The Catalogue Committee revealed plans for issuing the Association's 1937 Catalogue during the fall and winter months. A drive for new members will also be started during the next sixty days.

The organization is looking forward to a very successful year under the guidance of President J. S. Gilman, of the W. H. Ziegler Company, Minneapolis, Minnesota. The other officers and directors in attendance were:

G. F. Lowe, First Vice-President, Chicago, Illinois; A. F. Sersanous, Second Vice-President, Portland, Ore.; A. C. Blaisdell, Secretary-Treasurer, Cincinnati, Ohio; E. K. Hurst, Sioux Falls, South Dakota; H. W. Fletcher, New Orleans, Louisiana; E. S. Jenison, San Francisco, California; John C. Louis, Baltimore, Maryland.

The following members were also present: Mort Hunter, O. B. Avery, Victor L. Phillips, Hugo Stam.

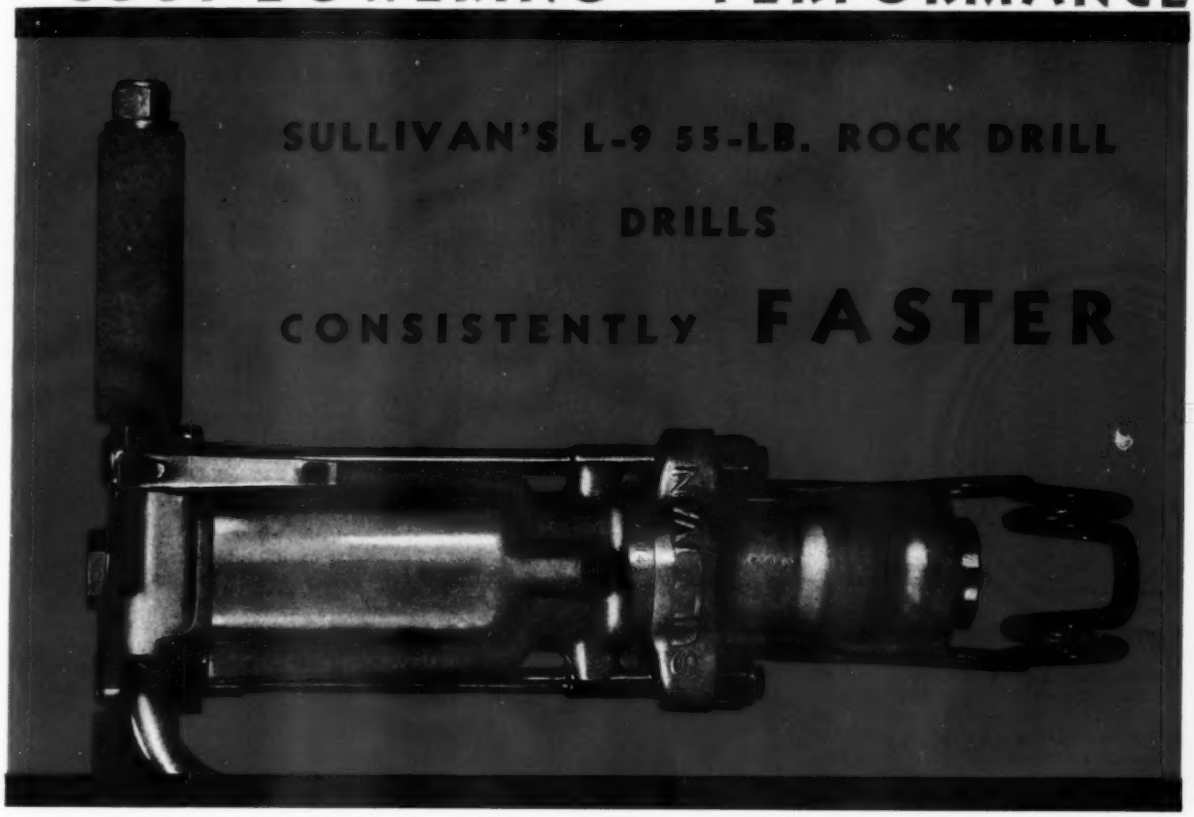
Work Resumed on Colorado River Aqueduct

By Kay Campbell

THIS month sees renewed activity along the aqueduct, following the layoff necessitated by summer heat. Among new work will be three new pipe line sections, linking the Monro-

• *Arc welding the reinforcement for 16-foot diameter concrete pipe in the Riverside, California, plant of the American Concrete and Steel Pipe Company. The reinforcing forms are being used on the Colorado River Aqueduct.*

"COST-LOWERING" PERFORMANCE



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● *Moving forms on the Fan Hill section of the aqueduct. Work is being handled by Metropolitan Water District force account.*

via, Pasadena, Sierra Madre, and San Rafael tunnels at an estimated cost of $1,500,000. United Concrete Pipe Corporation was low bidder on the 4½ miles of new units, with a bid price of $955,332 for the pre-cast pipe.

Bids were called on August 27 for Hayfield Lift, the most westerly of the pumping stations and the last of the five to be advertised. Located 270 miles east of Los Angeles, near the Hayfield Reservoir, this lift will be the highest on the Aqueduct (1616 feet). It will contain nine pumps, each with a capacity of approximately 200 cubic feet per second.

Tunnel work was not suspended during the summer, and only about six miles (San Jacinto) remain to be excavated on the main line. About three miles remain to be drilled on distribution lines. To date, more than 50 per cent of the tunnel linings have been concreted.

Less than one-third of the total canal, siphon and conduit excavation remains to be done along the main line. Concreting to be done is approximately the same amount, as pouring has followed excavation closely.

Road Builders' Convention

THE 1937 Convention and Exhibit of the American Road Builders' Association will be held in New Orleans, La., during the week of next January 11, according to announcement made by Charles M. Upham, Engineer-director of the Association. This will be the first time the A.R.B.A. has held its Convention in the South.

The 1937 program will be drafted with the Convention as the central feature of the national highway conclave, according to Mr. Upham. No effort will be made to hold a heavy-equipment road show, but booths will be available to manufacturers of equipment and producers of materials who desire to exhibit models and literature. The fact that no heavy equipment will be exhibited made it possible for the Joint Committee to consider the invitations of cities that have abundant hotel accommodations but that do not have facilities for displaying heavy machinery.

The 1937 Convention Program, as drafted by a special Committee designated to determine subjects and speakers, gives assurance that the range of highway topics and the qualifications of speakers will set a new record at the New Orleans meeting.

"The 1936 Convention and Road Show of the American Road Builders' Association, held in Cleveland, demonstrated that members of the highway industry and profession are in a highly receptive attitude toward all policies that will effect economies and stability in road building," said Colonel Chevalier. "The New Orleans Convention must supply all of the information that road builders desire in connection with highway administration, financing, engineering, construction, and maintenance. Also, it is absolutely necessary that the Convention serve as a clearing-house for the very latest information on highway safety and other allied subjects that are an integral part of highway transportation."

The highway program for the current fiscal year will involve the expenditure of more than a billion dollars. Congress has authorized Federal-aid through the fiscal year 1939, thus providing an orderly construction program for the next three years. One of the new items that will enter into the two-year program beginning next year is the authorization made by Congress for Federal-aid for secondary and farm-to-market roads. The coming A.R.B.A. Convention program will include full discussion of policies proposed for the most effective application of these funds.

International Acetylene Association to Meet in St. Louis

THE International Acetylene Association will hold its Thirty-seventh Annual Convention in St. Louis at the Jefferson Hotel, November 18, 19 and 20.

Technical sessions will be held each afternoon and on two evenings. The oxy-acetylene process for welding and cutting metals will be featured at these sessions. As the result of a year of unusual developments, a series of vitally interesting subjects will be discussed

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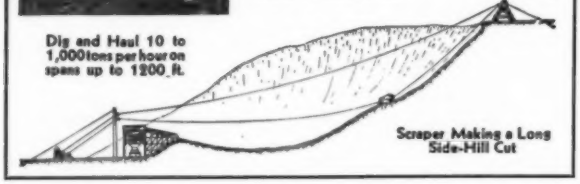

Scraper Making a Long Side-Hill Cut

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draglines bring outstanding dependability to the job—a characteristic particularly appreciated when the job is in an isolated section, far from the conveniences of quick transportation, city supplies and repair shops. The Walker moves and operates in rough or soft footing. It saves time moving by stepping off in a direct line to the best operating position; handles big yardage at low cost. Bucyrus-Monighan Co., Chicago, Illinois.

Bucyrus-Monighan 270 Diesel Dragline, owned by Cary, Baxter & Kennedy, Carbondale, Pennsylvania

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by speakers who are key men in their fields.

A cordial invitation to attend this Convention is extended to everyone interested in the practical applications of the oxy-acetylene process.

Highway Research Board to Meet

THE 16th Annual Meeting of the Highway Research Board of the National Research Council will be held in Washington, D. C., on November 18-20, 1936. Information concerning details of this meeting can be secured from Director Roy W. Crum, 2101 Constitution Avenue, Washington, D. C.

Savannah Bluff Lock and Dam

By Hal David

CONSTRUCTION work on the new Savannah Bluff Lock and Dam on the Savannah River near Augusta, Georgia, will be completed by December 1 of this year, according to W. A. Wells, U. S. Engineer in charge.

The Arundel Corporation of Baltimore were awarded the contract for the project. Work began in October, 1934, and is now 80 per cent complete with only about 6,500 yards of concrete (of a 50,000-yard total) remaining to be poured. Total cost for lock and dam will be about $2,000,000. Excavation, handled with 1¼-yard draglines and 1½-yard derrick boats, amounted to 133,000 yards.

The lock is of the Alleghany River type, with miter gates and a 56 by 360-foot lock chamber. The dam consists of a concrete sill extending across the river with piers spaced 72 feet on centers, leaving a clear opening of 60 feet between piers. Gates sliding vertically in recesses in these piers can be raised five feet above any known flood stage.

Since the work began two years ago, when four barges came up the river loaded with machinery and supplies, a separate city has grown up at the dam site, provided with its own railroad, ferries, lighting system, etc.

● *The first section of the Savannah Bluff Lock and Dam, near Augusta, Georgia, as it looked under construction.*

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Testing Placer Dredging Areas

(Continued from page 465)

This usually took three men four or five minutes or longer and ran into high figures if frequent shifts were required. We therefore abandoned the threaded connections requiring the use of heavy stem wrenches and substituted the simple arrangement shown in Fig. 8. Each of the drill tools had their stems fitted with a solid box eye. The casing elevator stem was similarly fitted. The wire line screw socket was replaced with a shackle and pin. The main pin was guarded in place with a cotter. Thereafter, if the boys wanted to show what they could do, tools could be changed in around 30 seconds instead of 4 to 5 minutes. It should be added, however, that even though the theoretical strength of the wire rope shackle was supposed to be greatly in excess of the rope, it proved too light for constant use. Several spare parts were carried in stock, as this was cheaper than to have a special shackle designed and fabricated.

Accessory Equipment

This involved a mobile water supply system and a washing plant, wheel mounted, for treating the excavated material. Of course the complete field outfit included all necessary survey and assay equipment, drafting room supplies, and minor items. These latter need not be referred to further, but the water system and the recovery plant are worthy of description.

Water Supply: A wheel-mounted 5 h.p. Typhoon, gasoline- driven pump, with multiple "V" belt drive, was purchased from the Fairbanks Morse Co., together with ten 50 ft. lengths of fire hose. This enabled the pump to be set up on the bank of the main stream of the valley and to deliver water to the operation as needed. The pump only required moving when a new cross section was to be drilled. (See Fig. 9.)

Recovery Plant: This was arranged so that the flow sheet would parallel that of a dredge. It was then tested with synthetic samples, and adjustments made until the results showed that gold particles down to the smallest granular speck that a dredge might be expected to save would be retained. It was not desirable to recover with any great efficiency in this case. The final results from each hole were intended to be a very close but conservative approach to recoverable values that should be expected under commercial exploitation. Very fine flaky gold — of which but minor amounts were encountered —were lost in the tailing. The washing plant used is shown in Fig. 10 and functioned as follows:

Washing Plant Operator

The excavated material from the drill was accumulated in a square, wooden, water-tight box, whence it was fed with as great evenness as possible to the feed hopper by hand. The machine in question was an old model Mine & Smelter Supply Co. type 12-S Placer Machine, which was found available, at no cost, in the vicinity. A later model, having greater capacity and augmented by a small clean-up machine, would have resulted in greater speed and would be preferred in the future. Water entered the hopper, whence the pulp flowed to a washing trommel with ¼" screens, under a far too mild spray of wash water. Oversize ran to waste through a chute, but it was always necessary to have an attendant watching closely to make certain that all over-size was completely scoured before being discharged. Undersize was led through a launder to a bakelite or hard rubber vibrating riffles, which discharged to waste. The sluice box was added to the original machine in the course of experiments with synthetic samples.

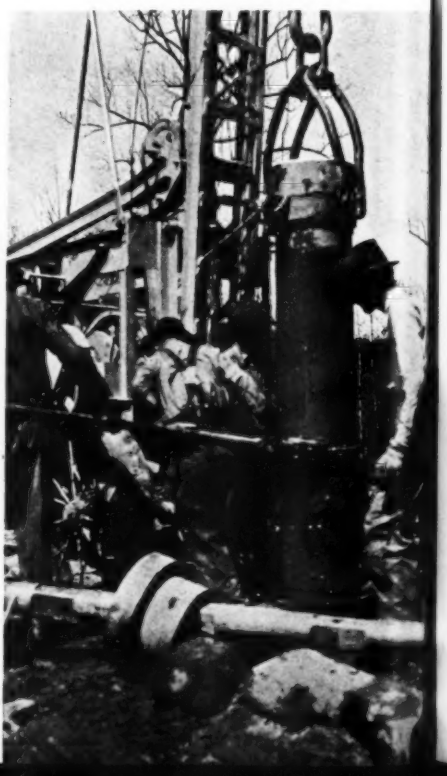
The washer was driven by a small air-cooled gasoline engine, which operated the trommel, the water-supply pump and the vibrating riffle through V-belts. The machine, originally on skids, was mounted in the field on an old "Model T" chassis. Its maximum efficient capacity turned out to be about 2 cubic yards in 9 hours. A machine that would handle 3½ to 4 cubic yards would be far preferable, even with 12" casing in place of the 16" which was used in this instance.

In the above arrangement, the washing trommel simulates that of a dredge, the vibrating riffle represents the sluice box for coarser gold and the 12 feet of riffle box represents the gold saving tables. The gold recovered was divided as to size between the two devices in very close conformity with the sizes that a dredge would recover in its corresponding gold-saving equipment.

Operating Results

The working costs tabulated below are for the three months of March, April and May, 1936. During this period cross-sections were drilled with holes centered at 50 ft. Approximately 2 miles of valley bottoms were tested, involving 21 cross-sections. It is to be particularly noted that the quick-change links were not received until April 16th. The continued improvement they brought about—aided and abetted by the growing efficiency of the drill

Fig. 7—Disconnecting a section of 16-inch casing. This picture was taken only a few minutes after Fig. 6.



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★More than 90 per cent of all electric shovels manufactured by the two leading shovel manufacturers are equipped by General Electric.

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Fig. 8—Quick change link, showing solid box eye on end of tool stem, shackled to the wire line.

Fig. 9—Fairbanks-Morse Typhoon pump, and the fire-hose which delivered to the washing plant.

crew generally — is reflected in the lowered cost per foot during each of the three months.

The crew consisted of an expert driller, 4 men, 2 boys, a span of mules and teamster, and a resident engineer in charge. The costs included detailed surveys with accurate leveling, mapping and cross-sectioning, gold determinations, and administration. To show the actual cost of operating the drill, the table has been split so as to segregate drilling from administration, mapping, etc. As reports were rendered at the end of each week, the monthly periods are seen to be approximate, embracing four weeks in two cases and five in another.

Conclusions

(1) The methods outlined have proved beyond much chance for doubt that the accuracy of the results obtained from each hole are open to far less question than under any other system, for the physical conditions described. In several instances the casing was left over night, after the sample had been excavated, in ground 20 ft. deep with no visible water in the bottom and without so much as a teaspoonful being in evidence the next morning. Mechanical salting is hardly likely in such a case. In still other cases when quicksand was struck, the casing was permitted to settle slowly under its own weight until it reached a stable footing. There seems little reason to suppose that the sample obtained in this instance was not also accurate as could be wished for. In still another hole, a piece of gravel 19 inches by 10 inches by 12 inches was removed intact by the orange peel bucket without in any way risking the sample's integrity.

(2) The care that was exercised in testing and adjusting the washing plant before drilling was begun, so as to synchronize its gold-saving efficiency as closely as possible with that to be expected from a modern dredge, was well worth while, leaving little room to question the results from this department.

(3) The tabulation of costs is interesting in that it discloses a marked, progressive downward trend in the cost per foot and a sharp rise in the average daily footage immediately following the installation of the "quick-change" links.

(4) The operation was handicapped by wheel mounting of the rig, casing and casing tools much larger and more cumbersome than necessary and the inability of the washing plant to keep pace with the full capacity of the drill.

(5) It is believed that, with the

Operating Statistics and Costs

Period—	March Mar. 1-28	April Mar. 30- May 2	May May 4-30	Three Months Mar. 1-May 30
No. of weeks:	4	5	4	13
Work Days Available:	24	28 (A)	24	76 days
Days in Operation:	19	27	21	67 days
Days Idle:	5	1	3	9 days
Days Idle-Reason: Blizzard, Mud-Floods, Mud Tool Breakage				
Length of Balley Tested	0.6 mile	0.7 mile	0.8 mile	2.1 mile
Total Dist. Rig moved	0.9 mile	2,1 miles	5.3 miles (C)	8.3 mile
Footage Sunk:	**403′**	**563′ (B)**	**564′**	**1,530′**
Footage per day Operated	21.2′	20.9′	26.9′	22.8′
Drilling cost	$721.68	$871.79	$666.43	$2,159.90
Administration, etc.	457.05	572.65	464.42	1,494.12
Total Field Expense	1,178.73	1,444.44	1,130.85	3,754.02
Unit Cost, Drilling	$1.79 per ft.	$1.55 per ft.	$1.18 per ft.	Av. $1.43 ft.
Unit Cost Admin.	1.13	1.02	.82	Av. .92
Unit Field Cost:	2.92 per ft.	2.57 per ft.	2.00 per ft.	2.35 ft.

Note: (A) Easter holidays. (B) quick-change links went into service April 16th. (C) Includes moving 4½ miles down stream.

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Mighty holding power combined with uniform, smooth release—amazing resistance to wear without a trace of the flange-scoring tendency common

1 The purest and best grade of asbestos spinning fibre.

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These and other features of Deep-Well Woven assure faster, safer operation with new low costs for brake maintenance. Descriptive literature and prices on request.

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Shovel Drives often hold the ANSWER

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ELECTRIC SHOVEL DRIVES

rig mounted on caterpillars, delivering to a washing plant capable of handling 3½ to 4 cubic yards in 9 hours, and using 12 inch casing excavated by a power-operated orange-peel bucket, an average of from 40 to 45 feet of hole per working day (10 hours) can be maintained in good weather. It is further felt that, under these modified conditions and greatly increased speed, operating costs can be reduced to approximately the following:

Operating cost, Drilling	$0.90 per ft.
Administration, Etc.	0.60 per ft.
Total Field Cost:	$1.50 per ft.

(6) In view of the cost of the field equipment, which amounts to nearly $7,500, including all details, it follows that the described system applies generally to large areas. However, even though some of these might feasibly be prospected by the usual shaft method, it would nevertheless appear that the speed, low operating cost and integrity of results, from each and every hole put down should swing the choice of method to the technique herein described.

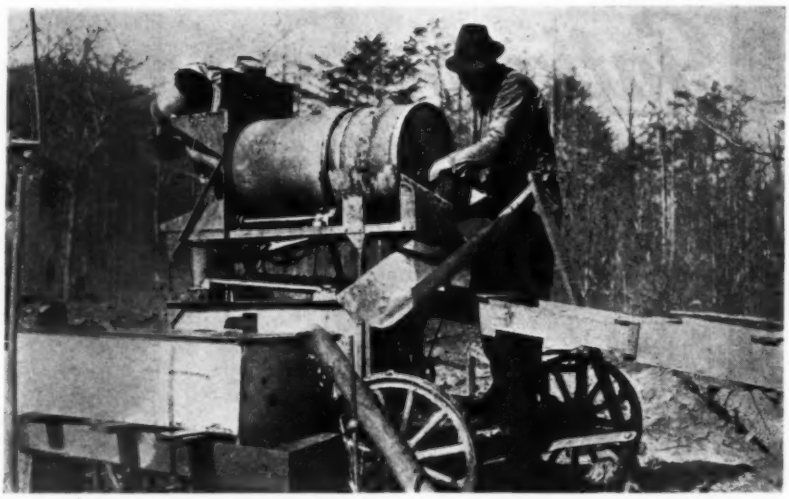

Fig. 10—An attendant at the washing plant inspects oversize for thorough scouring.

Acknowledgments

Before closing, acknowledgments are due Simon Lake for his invaluable information concerning his own drilling experiences in this same region many years ago, while seeking a "proving ground" for an experimental dredge. Sincere appreciation is also to be expressed for the suggestions received from James Gatto, driller, during the progress of the field work and from W. B. Millar, Jr., Engineer in Charge; as well as to F. Leslie-Jones of the Bucyrus-Erie Company, and finally to A. H. McNeer for his many authoritative comments and factual data concerning a number of other placer regions in the Southern Appalachian Mountains.

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WILLIAMS BUCKETS

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Trade Notes

Appointment of the **Maine Truck-Tractor Company,** 158 Verona Street, Portland, Maine, as a new small shovel distributor for Bucyrus-Erie Company, has been announced. The state of Maine and part of New Hampshire will be the territory covered.

In the South, the **Mississippi Road Supply Company,** Box 1491, Jackson, Mississippi, has been appointed as a distributor for Bucyrus-Erie shovels up to, and including, the 48-B. Territory covered by this company will be the state of Mississippi.

The Arizona Lumber Company with headquarters at 9th and Jefferson Street, Phoenix, Arizona, has been appointed as a distributor for Koehring products, consisting of Shovels, Cranes, Draglines, Dumptors, Pavers, Mixers, Mud-Jacks and Trail-Dumps. The state of Arizona has been designated as the territory for the Arizona Lumber Company.

The Dallas territory is now being handled by the **Leland Equipment Company** of Texas, 3918 Main Street, Dallas, Texas. Mr. Burrows, formerly of Clark & Burrows, remains as an active member, to continue to serve his many friends established during his activity in the Dallas office.

Roanoke Tractor & Equipment Company, 405 Center Ave., N. W. Roanoke, Virginia, is now serving the Virginia territory. Mr. W. H. McIlhany will act as manager.

Broderick & Bascom Rope Company of St. Louis has announced the opening of a branch office and warehouse at 1500 South Western Avenue, Chicago, Ill. Present distributors in Chicago and North Central states will continue to represent the company.

E. M. Stephanus will be in charge of the Chicago office and immediately adjacent territory. K. B. Britt will take over the remaining territory previously covered by Mr. Stephanus.

W. H. Hammond, sales manager of the hoist and body division, **Gar Wood Industries, Inc.,** has announced the recent appointment of the following distributors: Shaw Sales Company, Billings, Montana; A. Fassnacht & Sons, Chattanooga, Tennessee; Baker Equipment Engineering Company, Charlotte, North Carolina; Lone Star Equipment Company, El Paso, Texas; Mississippi Truck Equipment Co., Inc., Jackson, Mississippi; C. W. Rathbun Company, Oklahoma City, Oklahoma; Allison Steel Manufacturing Company, Phoenix, Arizona; Felt Auto Parts Company, Salt Lake City, Utah; Union Iron Works, Spokane, Washington.

Lincoln Electric Company of Cleveland, Ohio, have moved their San Francisco office from 894 to 866 Folsom Street. New quarters are 25 by 150 feet, are located near the San Francisco approach to the Bay Bridge, and combine office space, display room, and warehouse.

Book Reviews

Inflation's Timing is a 64-page study of the progress through early, critical and explosive stages of five great inflations. Characteristics of each stage during each inflation are described with a view toward attempting to see just where the United States stands at present, and what future developments may be. Written by D. G. Ferguson and A. H. Foster, the booklet is published by the American Institute for Economic Research, 1200 Massachusetts Ave., Cambridge, Mass. It is an excellent companion work to "What Devaluation Will Mean to You," also published by the Institute. Copies of these booklets may be obtained for one dollar each.

New practices for uses of explosives in erosion control, which have been developed by agricultural engineers, are described in a 36-page booklet entitled **"Blasting Gully Banks with Explosives."** It has just come from the press and is being distributed without charge by the Agricultural Extension Section, E. I. du Pont de Nemours & Company, Wilmington, Del.

The principal divisions of the general subject cover the problem of erosion, control of gully erosion, preparation of the soil in gullied areas before breaking down gully banks, and gully bank grading. Other sections of the booklet are devoted to terracing farm lands and tree cultivation. The booklet is illustrated with plates from photographs, line drawings and diagrams.

Three-wheeled elevating graders are described in a broadside recently issued by the **Austin-Western Road Machinery Company,** Aurora, Illinois. Features of the machine are illustrated and discussed. Specifications are given; operating views shown. Copies may be obtained by writing to Austin-Western.

Features of a new hand-rotated stopper are given in a bulletin issued by the **Worthington Pump and Machinery Corporation,** Harrison, New Jersey. Operating photographs show the tool in action, and specifications are included.

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DRAGLINE OPERATOR

Operator having 10 years' experience on Diesel dragline, on levee and canal construction desires position on Diesel machine of 3 to 8-yard capacity, preferably Bucyrus-Monighan dragline. Willing to go anywhere. Can do own repair work. A-1 references. Age 30; married. At present located in Nebraska. Box 8301

STEAM SHOVEL OPERATOR

Have 25 years' experience on steam machines on all kinds of construction work. Desire position on any make, size or type steam shovel; anywhere. Can do own repair work. Best references furnished. Age 50. Married. At present located in Missouri. Write Box 8105.

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Operator—10 years' experience on shovel dragline and clamshell—on general excavation and mining—desires work on any make and type machine. Can do own repair work. Will go anywhere. Age 40; single. Best of references. Present location near Chicago. Box 8001.

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Experienced crane and dragline operator wishes work preferably on Bucyrus dragline or piledriver. Has operated steam and gasoline machines for 15 years. Willing to go anywhere in U. S. Can do own repair work. Age 39; married. Good references. Located near Chicago. Box 8002.

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1 16'0" TYPE "A"—Complete. New. H-16.
1 16'0"—43-B—Complete. New. H-17.
1 17'0"—TYPE "A"—Complete. New. H-18.
1 17'0"—20-B HIGH LIFT—Complete. New. H-19.
1 17'0"—37-B—Complete. Used. H-21.
1 19'6"—37-B—Complete. New. H-25.

BOOMS

1—15'0" 1030 CHAIN CROWD SHOVEL BOOM—Used. JA-32.
4—18' 20-B STEAM SHOVEL BOOM—New JA-2.
1—18' 31-B STEAM SHOVEL BOOM—New. JA-3.
1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-23.
1—20'0" 1020 ROPE CROWD SHOVEL BOOM—New. JA-33.
1—20'0" 1030 CHAIN CROWD SHOVEL BOOM—New. JA-24.
2—20'6" 20-B STEAM SHOVEL BOOM—New. JA-4.
1—21'3" Type "B" Bar Boom—New. JA-37.
1—21'6" 37-B CHAIN CROWD SHOVEL BOOM—New. JA-26.
1—21'9" 31-B STEAM SHOVEL BOOM—New. JA-5.
2—22'0" 43-B CHAIN CROWD SHOVEL BOOM—Used. JA-27.
3—23' 20-B DIESEL, GAS OR ELECTRIC SHOVEL BOOM—New. JA-7.
1—23'6" 37-B ROPE CROWD SHOVEL BOOM—New. JA-28.
1—24'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-29.
1—24'0" GA-2 DRAG SHOVEL BOOM—New. JA-30.
1—24'0" GA-2 DRAG SHOVEL BOOM—Used. JA-34.
1—24'0 GA-3 DRAG SHOVEL BOOM—New. JA-35.
1—24' GA-2 or GA-3 SHOVEL BOOM—New. JA-8.
2—24' 43-B ROPE CROWD SHOVEL BOOM—New. JA-9.
1—25'0" 37-B ROPE CROWD SHOVEL BOOM—Used. JA-36.
1—25'9" 30-B DIESEL SHOVEL BOOM—New. JA-10.
1—26' 20-B DIESEL SHOVEL—New. JA-11.
2—26' D-2 SHOVEL BOOM—New. JA-13.
1—26' 50-B STEAM SHOVEL BOOM—New. JA-15.
3—27' 43-B ROPE CROWD SHOVEL BOOM—New. JA-16.
1—27'0" 43-B ROPE CROWD SHOVEL BOOM—New. JA-31.
1—30' 50-B ELECTRIC SHOVEL BOOM—New. JA-17.
3—30' 50-B STEAM SHOVEL BOOM—New. JA-18.
1—40' 20-B, 31-B and D-2 DRAGLINE BOOM—Used. JA-20.

DIPPERS

Small Machines

3 ½ CU. YD.—Plate Front—Will fit 1020 Drag Shovel. New. D-45.

2 ⅝ CU. YD.—Plate Front—Will fit 20-B. New. D-12.

1 2/3 CU. YD.—Plate Front—Will fit 14-B. New. D-13.

1 ¾ CU. YD.—Rock Type—Will fit 20-B New. D-67.

1 ⅞ CU. YD.—Ins. Tooth—Will fit 1030. New. D-47.

1 1 CU. YD.—Plate Front—Will fit 20-B. New. D-42.

1 1 CU. YD.—Rock Type—Will fit 1030 Tunnel Shovel. New. D-50.

2 1¼ CU. YD.—Ins. Tooth—Will fit 30-B, 41-B, 42-B, E-2. New. D-44.

1 1¼ CU. YD.—Rock Type—Will fit 30-B, 41-B, 42-B, E-2. Used. D-27.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-52.

1 1¼ CU. YD. — Ins. Tooth — Will fit 37-B. Used. D-38.

1 1½ CU. YD.—Ins. Tooth—Will fit 42-B, 43-B. New. D-55.

1 1½ CU. YD.—Ins. Tooth—Will fit 43-B. Used. D-39.

3 1¾ CU. YD.—Ins. Tooth—Will fit 43-B. New. D-58.

1 1 CU. YD. PLATE FRONT—Will fit 30-B, 41-B, 42-B, E-2. New. D-65.

Large Machines

1 2 CU. YD.—Manganese—Will fit 43-B. New. D-62.

1 3 CU. YD.—2½" Molybdenum cast steel front, two part Van Port reversible teeth—Will fit 100-B, 68-C, 70-C. New. D-2.

1 3½ CU. YD.—2¾" nickel chrome steel front. two part Van Port reversible teeth—Will fit 88-C, 95-C, Class 80 Atlantic. New. D-3.

1 4 CU. YD.—2¾" Molybdenum cast steel front, two part reversible teeth. In good condition.—Will fit 100-C, 120-B. Used. D-4.

1 6 CU. YD.—Molybdenum steel front. Annealed cast steel back, two-part Reversible Van Port Teeth.—Will fit 200-B, 225-B and 320-B. New. D-11.

1 8 CU. YD.—Front Molydenum steel, two part Van Port Reversible teeth. Slightly used but excellent condition.—Will fit 320-B. Used. D-6.

DIPPER TRIPS

1—30-B STEAM DIPPER TRIP—New. DT-1.

1—31-B STEAM DIPPER TRIP—New. DT-2.

4—50-B STEAM DIPPER TRIPS—New DT-4.

BUCKETS

Dragline

3 2 CU. YD.—PAGE CLASS "C". 5630 lbs. New. DB-4.

1 2 CU. YD.—BECO TYPE "U". 3650 lbs. Rebuilt. DB-12.

1 2 CU. YD.—BECO TYPE "X". 5300 lbs. New. DB-23.

2 2 CU. YD.—BECO HEAVY DUTY. 5400 lbs. New. DB-24.

3 2¼ CU. YD.—BECO TYPE "U". 3850 lbs. New. DB-13.

2 2½ CU. YD.—BECO TYPE "U". 4100 lbs. New. DB-14.

1 2½ CU. YD.—BECO HEAVY DUTY. 6500 lbs. Rebuilt. DB-9.

1 2½ CU. YD.—OMAHA—STD. 5400 lbs. Rebuilt. DB-16.

1 5 CU. YD.—MONIGHAN HEAVY DUTY. 12000 lbs. New. DB-16.

1 6 CU. YD.—MONIGHAN TYPE "W". 12500 lbs. New. DB-17.

1 7 CU. YD.—MONIGHAN TYPE "W". 1370 lbs. New DB-18.

Clamshell

1 2 CU. YD. TYPE PF WILLIAMS CLAM-SHELL BUCKET without teeth and counter-weight. CSB-1.

ELECTRICAL EQUIPMENT

90 H.P. MOTOR — GENERAL ELECTRIC — 3 phase, 25 cycle, 550 volt, 1500 RPM. NEW. EE-1.

5 KVA TRANSFORMER—GENERAL ELECTRIC—2200-3810 volt primary, 440-220 volt secondary—3 phase, 60 cycle, with cast iron tank and cover, including specially fastened bushings to prevent oil leakage. NEW. EE-4.

TANKS

Water

5—260 GALLON 41⅜"x21"x6'4". No. 14 BW gauge steel plate. T-1.

2—200 GALLON 36½"x20 1/16"x6'3" high. Elliptical—¼" steel plates. T-2.

1—283 GALLON 54⅜"x17⅜"x6'4". ¼" Steel plates. T-3.

Oil

4—60 GALLON 11½"x18"x77" Elliptical Blue annealed copper alloy smooth plate. T-4.

6—25 GALLON 47¼" dia. 14" deep—12 Gauge Std. Blue annealed copper alloy steel. T-5.

1—294 GALLON 48"x21¼"x6'4". ¼" steel plates. T-6.

4—50 GALLON 60" dia. x 12" deep—No. 12 Gauge Std. blue annealed copper alloy. T-7.

Gasoline

1—44 GALLON 18" dia. 43" high—No. 14 Gauge U. S. Std. welded construction. T-8.

6—55 GALLON 30"x18½"x23½" 16 Gauge—U.S.S. Terne metal. (1 copper brazed and 5 soldered) T-9.

Air

2—5 CU FT.—16" dia. x 48" high—225 lb. working pressure A.S.M.E. Std. Tested to 340 lb. cold water test. T-10.

1—14 CU. FT.—21½" dia. x 77" high—200 lb. working pressure. Will pass inspection in Massachusetts and any Canadian Province. T-12.

2 16 CU. FT—22⅝" dia. 77" high—200 lb. working pressure A.S.M.E. Std. T-13.

ENGINES

Designed especially for application to Excavating or similar Equipment. Can be used for stationary or semi-stationary service.

Diesel

2—140 H.P. NEW, NON-REVERSIBLE ATLAS DIESEL ENGINES—5 cylinder, 9" bore x 10½" stroke. 514 R.P.M., 4 cycle, vertical overhead valves, dust proof, oil tight crank case and forced lubrication. Includes auxiliary air starting equipment. DE-2.

Steam

1 12½"x16" link reversing type for Railroad Shovel. ME-1.

2 4½"x5" reversible—20.8 H.P. at 400 R.P.M. 100 lb. Pressure. ME-2.

1 4¾"x5" reversible—23.2 H.P. at 400 R.P.M. 100 lb. Pressure. ME-3.

1 5"x5" reversible—25.6 H.P. at 400 R.P.M. 100 lb. Pressure. ME-4.

BOILERS

NEW

Will Make That Old Shovel Work Like New.

Can also be used for Miscellaneous Service

Vertical Type

1 46½"x110"—32 H.P.—155 lb. Working Pressure. Special Wood Burning Fire Box. ASME Std. Will fit any B-2 or B-3. B-9.

Locomotive Type

2 44'x17'—75 H.P. 125 lb. Working Pressure. ASME Std. Will fit Model 68-C. B-15.

1—70"x12'—136 H.P. 175 lb. Working Pressure. ASME and Mass. Std. Will fit 126-B. B-18.

AIR COMPRESSORS

1 BRAND NEW WORTHINGTON—METAL-WELD—2-cylinder 7"x6" Vertical 162 cu. ft. piston displacement, Air Compressor. Fitted with Laidlaw feather valves—Lugs on side for mounting on skids or channels—Shaft extended and equipped with semi-flexible coupling to take 2⅝" drive shaft—Force feed lubrication. Automatic control. Includes 1" High capacity centrifugal circulating pump—"V" belt driven—18"x41" Air Receiver, 100 pounds working pressure, A.S.M.E. Standard. Electric or gasoline power required approximately 30 H.P., approximately 1000 R.P.M.—Compressor Speed approximately 550 R.P.M.—Overall dimensions: Height 45"—length 37½"—width 28". AC-3.

2 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. NEW. AC-1.

1 11"x11"x12" STEAM DRIVEN LOCOMOTIVE TYPE, Westinghouse air compressors with fittings. Used. Make offer. AC-2.

FOR SALE

RATES

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SMALL SHOVELS
Under 2 Yards

⅜-YARD

BAY CITY—¾ YARD GASOLINE SHOVEL AND TRENCH HOE. Located Connecticut. Bargain price. Box 908-SS

BUCYRUS-ERIE 10-B GASOLINE SHOVEL. 14" cat treads. Hercules engine. Excellent condition. Located North Carolina. Box 907-SS

BUCYRUS-ERIE 10-B DIESEL DRAGLINE, 25 foot boom, long cat. Long side frames—20" treads. ⅜ yard AU drag bucket. Buda four cylinder 3⅝"x4½" Diesel engine with Excello fuel pump and fuel supply pump with filter. Kohler 800 watt light plant. Used as demonstrator. New machine guarantee. Located New York. Box 861-SS.

INSLEY — TYPE C — GASOLINE SHOVEL. Engine recently rebored and reconditioned. Machine generally in good operating and mechanical condition. Equipped with Buda type KTU Diesel engine. Located Arkansas. Box 814-SS.

INSLEY Type C Combination Shovel and Skimmer Scoop. Buda 4-cylinder 4"x5½" Type KTU Engine. Field reconditioned. Excellent condition. Located Georgia. Box 834-SS.

INSLEY COMBINATION GASOLINE SHOVEL AND DRAGSHOVEL—⅜ cubic yard. Located Massachusetts. Box 847-SS.

UNIVERSAL-UNIT ¾-swing combination ⅝ cu. yd. gasoline shovel and 30-foot boom dragline, including ⅝ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SS.

½-YARD

BAY CITY MODEL K-2 half yard gas shovel. Box 862-SS.

BROWNHOIST MODEL NO. 2 ½ cu. yd. rope crowd gasoline shovel or clamshell. Waukesha four cylinder engine in good operating condition. Bargain price. Located near Peoria, Illinois. Box 689-SS.

BYERS BEARCAT combination ½ yard skimmer scoop and ⅜ yard back hoe. Used only 4 months; stored inside. No reasonable offer refused. Located Eastern Pa. Box 902-SS

P & H MODEL 300-A DIESEL SHOVEL and clamshell 18' boom—13' dipper handle—⅝ yard dipper—17" cat treads. 35' plus 5' extension clamshell boom. No bucket. Cat Diesel three cylinder D-6100 engine. Located Northern Florida. Box 863-SS.

SPEEDER B-2 ½ YARD GAS SHOVEL. 16' Boom. 12' dipper handle. ½ yard plate dipper. 16" cat treads. Weight 29,200 lbs. Hercules 4 cylinder gasoline engine. Good operating condition and appearance. Few minor repairs needed. Located Albuquerque, New Mexico. Box 910-SS

THEW TYPE S electric mining crawler shovel, ½-yard bucket, 20 h.p. and 12 h.p. Otis motors. Located in Minnesota. Box 832-SS.

⅝-YARD

P&H MODEL 300 SHOVEL—18' Boom, 15' Dipper Handle, ⅝ cubic yard Dipper, manganese front. Powered with Waukesha B U 4½"x6¼" engine, power clutch control. First class operating condition. Located Massachusetts. Box 663-SS.

¾-YARD

BUCYRUS-ERIE TYPE B STEAM COMBINATION SHOVEL-CLAMSHELL AND STEAM HOE. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SS.

BUCYRUS-ERIE—TYPE B—Combination shovel and 40' boom crane. Boiler refued and the machine in fair operating condition. Located Arkansas. Box 815-SS.

BUCYRUS-ERIE TYPE B HIGH LIFT STEAM SHOVEL. Caterpillar mounted. Good operating condition. Located New Haven, Connecticut. Box 776-SS.

BUCYRUS-ERIE TYPE B CATERPILLAR MOUNTED, HIGH LIFT STEAM SHOVEL. Good operating condition. Located Connecticut. Box 775-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, equipped with 19'6" boom 16' dipper stick and ¾ yard dipper including 36' clamshell boom in good working order. Located near Hudson, Pennsylvania. Price $1000.00. Box 493-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL, Cat. mounted, 19'6" boom, 14' dipper handle, ¾ cubic yard dipper, also 36' clamshell boom and front drum and gearing. Located Kansas City, Missouri. Box 622-SS.

BUCYRUS-ERIE 20-B COMBINATION STEAM SHOVEL - CLAMSHELL - DRAGLINE. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SS.

BUCYRUS-ERIE TYPE B STANDARD ¾ YARD STEAM SHOVEL—Quarry type Dipper — Caterpillar mounted. Good operating condition. Located Georgia. Box 752-SS.

TYPE B BUCYRUS-ERIE HIGH LIFT STEAM SHOVEL 21'3" Boom, 18'4" Dipper Handle. ¾ cubic yard inserted Tooth Dipper—Power Boom Hoist — Boiler Feed Pump — Caterpillar Mounted. Located Chicago. Box 699-SS.

BUCYRUS-ERIE 1030 GAS SHOVEL AND CLAMSHELL. 23' shovel boom, 15' dipper handle—¾ yard dipper. Rope crowd. 40' clamshell boom. No bucket. Wisconsin B-3 gas engine. Located Kentucky. Available about August 1. Box 864-SS.

BUCYRUS-ERIE TYPE B high lift steam shovel and 40' clamshell boom including front drum and gearing. Good working condition. Located Eastern Pennsylvania. Low price. Box 865-SS.

KOEHRING MODEL 301 ¾ yard gas shovel. Wisconsin 5"x6" engine. Good working condition. Located Louisville, Kentucky. Box 866-SS.

MARION MODEL 21 ELECTRIC—M.G. SET ¾ YARD SHOVEL. Good condition. Located eastern Pennsylvania. Box 725-SS.

NORTHWEST MODEL 3 GASOLINE CABLE CROWD—FEATHER TOUCH CONTROL—SHOVEL. Good operating condition. Located Chicago. Box 798-SS.

OSGOOD MODEL 18 Steam—¾ yard shovel—Cat mounted. Just completely overhauled. Excellent condition. Located near Indianapolis, Ind. Box 522-SS.

OSGOOD AIR TUNNEL SHOVEL. 13' boom, 8' dipper handle—¾ yard dipper. Located Western New York State. Box 867-SS.

⅞-YARD

MARION MODEL 21 — ⅞ CUBIC YARD STEAM SHOVEL. Caterpillar Mounted. Good working condition. Located Georgia. Box 758-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 21'3" Boom—16' Dipper Handle—⅞ cu. yd. inserted tooth Dipper. Good operating condition. Located Boston, Mass. Box 853-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL. 19'9" Boom— 16' Dipper Handle—⅞ cu. yd. Dipper. Located near Boston, Mass. Box 854-SS.

1-YARD

BUCYRUS-ERIE LATE MODEL B-2 STEAM HIGH LIFT SHOVEL. 1 yard dipper—single shaft cat mounting. Good condition. Located near St. Louis. Box 518-SS.

BUCYRUS-ERIE B-2 AIR TUNNEL SHOVEL. 14'6" boom, 10'9" dipper handle—⅞ yard dipper. Located Ohio. Box 869-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Waukesha four cylinder 5¾"x8" engine. Overhauled approximately one year ago. Good operating condition. Located Knoxville, Tennessee. Box 870-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—one yard dipper. Electric starter. Waukesha four cylinder 5¾"x8" gas engine. Located Louisville, Kentucky. Box 871-SS.

BUCYRUS-ERIE GA-2 GAS-AIR HIGHLIFT SHOVEL, 24' boom—16' dipper handle—one yard dipper. Single shaft cat. Electric starter. Waukesha 5¾"x8" four cylinder engine. Good operating condition. Located Boston. Box 875-SS.

BUCYRUS-ERIE GA-2 1-yard dipper. Mounted on caterpillars. Located in Minnesota. Box 831-SS.

BUCYRUS-ERIE 30-B STEAM SHOVEL. Located St. Louis, Missouri. Box 817-SS.

BUCYRUS-ERIE GA-2 — Gas-Air Combination High Lift Shovel and 50' Boom Dragline Equipment, mounted on Single Shaft Cat. Good operating condition. Located at Fort Smith, Ark. Box 537-SS.

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Very good working condition. Located South Carolina. Box 644-SS.

BUCYRUS-ERIE GA-2 COMBINATION SHOVEL AND DRAGLINE. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. 50' Dragline Boom including Fair leads but not Bucket. Air Starter. Good condition. Located Newark. Box 718-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 24' Boom—18'4" Dipper Handle, 1 cubic yard Inserted Tooth Dipper. Also includes Forward Drum and Gearing and mechanism for clamshell operation including 45' boom. Also 1 cubic yard Williams clamshell bucket. Waukesha WL Engine. Good operating condition. Located Chicago. Box 702-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

BUCYRUS-ERIE MODEL B-2 High Lift Steam Shovel. Caterpillar mounted. Good working condition. Located northern New Jersey. Price very reasonable. Box 643-SS.

LORAIN-THEW — A-1 — 1 YARD STEAM SHOVEL. 21' Boom. 15' Dipper handle. 1 yard dipper. Center drive cat. Located Toledo, Ohio. Box 912-SS

MARION MODEL 7 ONE-YARD STEAM SHOVEL, equipped with Model 450 boiler. Located Scranton, Pennsylvania. Box 873-SS.

MARION 1 CUBIC YARD STEAM SHOVEL. Bargain Price. Box 777-SS.

P & H MODEL 600 ONE YARD GAS SHOVEL. Just recently overhauled. Excellent condition. Located eastern Pennsylvania. Box 855-SS.

P & H MODEL 600—1 yd. Gasoline Shovel—including 40' boom dragline equipment without bucket. Waukesha Engine. Recently overhauled. Located in Alabama. Box 483-SS.

P&H—MODEL 600—Combination 1 yard shovel and 40' boom dragline including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SS.

P & H MODEL 600 GAS SHOVEL AND CLAMSHELL, 19'3" boom—14'3" dipper handle one yard dipper—40' clamshell boom—1½ yard rehandling clamshell bucket. Rebuilt 1933. Excellent condition. Located Kentucky. Box 874-SS.

1¼-YARD

BUCYRUS-ERIE — DIESEL-AIR — COMBINATION SHOVEL AND DRAGLINE. 22'6" Boom — 16' Dipper Handle — 1¼ cubic yard Inserted Tooth Dipper. 45' Boom. Complete Dragline Equipment without bucket. Engine—Atlas Diesel. Located Los Angeles, Cal. Good operating condition. Box 703-SS.

BUCYRUS-ERIE GA-2 HIGH LIFT SHOVEL. 22'-6" Boom. 14' dipper handle. 1¼ yard inserted teeth dipper. Steel cab. Electric starter. Waukesha WL-4 cylinder 6¼"x8" gas engine. Excellent condition. Located Texas. Box 913-SS

BUCYRUS-ERIE GAS-AIR TYPE GA-2 HIGH LIFT SHOVEL — 22'6" boom — 16' dipper handle—1¼ yard cast front inserted tooth dipper—single shaft caterpillar mounting—electric starter. Excellent condition. Field reconditioned. Waukesha 4-cylinder 6¼"x8" engine — New cylinder blocks and piston rings. Located near Scranton, Pennsylvania. Will demonstrate. Box 508-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—14' dipper handle 1¼ yard dipper. Single shaft cat. Steel cab. Electric starter. Waukesha four cylinder 6¼"x8" engine. First class condition. Located Texas. Box 876-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL. 22'6" boom—16' dipper handle—1¼ yard dipper. Electric starter. Single shaft cat. Very good condition. Located New Hampshire. Box 880-SS.

BUCYRUS-ERIE GA-2 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. Wisconsin D-2 gas engine—suitable 4000' altitude. Located Texas. Box 881-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL, 22'6" boom—16' dipper handle 1¼ yard dipper. Single shaft cat. D-2 Wisconsin gas engine. Very good condition. Located New Mexico. Box 882-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGHLIFT SHOVEL AND CLAMSHELL, 22'6" shovel boom—16' dipper handle—1¼ yard dipper—50' clamshell boom and equipment. Electric starter. Steel cab. D-2 Wisconsin six cylinder 5¼"x6½" gas engine. Box 884-SS.

BUCYRUS-ERIE 34-B GAS SHOVEL, 20' boom—16' dipper handle 1¼ yard dipper. Electric starter. Wisconsin six cylinder 5½x6½ engine only used about six months. Excellent condition. Located Connecticut. Box 885-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL. 21' boom—15' dipper handle—1¼ yard inserted tooth dipper—dipper trip. Boiler lagged. Located New York. Box 896-SS.

BUCYRUS-ERIE 41-B STEAM SHOVEL-CLAMSHELL-PILE DRIVER. 21' shovel boom 15' dipper handle—1¼ yard rock dipper 45' boom clamshell equipment—pile driving leads. Good operating condition. Available about November 1. Located New York. Box 897-SS.

BUCYRUS-ERIE 37-B GAS SHOVEL. 21'6" boom 15' dipper handle. 1¼ inserted tooth dipper—electric starter. Standard single shaft cat. Very good operating condition. Located Connecticut. Box 899-SS.

BUCYRUS-ERIE 37-B Gasoline Shovel. 23' Boom 17' Dipper handle. 1¼ cubic yard dipper. Chain Crowd. Wisconsin D-3 6-cylinder 5½"x6½" Engine. Reconditioned. Excellent condition. Located Vicinity of New York. Box 840-SS.

BYERS-MASTER 1¼ YARD GAS SHOVEL. Hercules four cylinder engine. Good operating condition. Located Eastern Pennsylvania. Box 898-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Field reconditioned. Available about August 15. Located New Mexico. Box 879-SS.

LIMA MODEL 101 GAS SHOVEL—21' boom 17' dipper handle—1¼ yard dipper. Located Eastern Pennsylvania. Box 886-SS.

LORAIN 75-A 1¼ YARD GAS SHOVEL. Reported good condition—will sell on terms. Located Memphis, Tennessee. Box 887-SS.

LINK-BELT MODEL K-42 1¼ YARD GASOLINE SHOVEL. Waukesha Model WL 6¼"x 8" 4-cylinder Engine—new blocks and pistons this year. Good working condition. Located Colorado. Box 738-SS.

LORAIN MODEL 75—1¼ YD. SHOVEL. 21'0" boom, 14' dipper handle. Engine—Waukesha WL 6-cylinder 6¼"x8" gasoline. Located—Denver, Colorado. Box 806-SS.

MARION MODEL 450 ELECTRIC SHOVEL AND DRAGLINE. 23' Shovel boom. 16½' dipper handle with new racking. 1¼ yard dipper. 45' dragline boom and machinery included. ¾ yard drag bucket. Suitable for power supply 3 phase, 60 cycle, 2300 volts. Excellent condition throughout. Located near Chicago. Box 914-SS

MARION TYPE 32 STEAMER. Shop No. 5676, 18' boom, 15' dipper handle, 1¼-cu. yd. dipper shipped May, 1926, good operating condition. Box 451-SS.

MARION MODEL 450 1¼ DIESEL SHOVEL. Located Eastern Pennsylvania. Box 889-SS.

MARION MODEL 450 ELECTRIC SHOVEL. 1¼ yard AC-DC 3 phase, 60 cycles, 440 volts. Located Eastern Pennsylvania. Box 890-SS.

P & H MODEL 650 SHOVEL. 23' boom—16' dipper handle—1¼ yard dipper. Electric starter. Split second control. Waukesha four cylinder 6¼"x8" engine. Machine shop rebuilt. Available about September 15. Located Milwaukee. Box 878-SS.

1½-YARD

BUCYRUS-ERIE 43-B GASOLINE CHAIN CROWD SHOVEL — 23' boom — 17' dipper handle—1½ cubic yard Vanderhoef dipper and teeth—electric starter—standard single shaft cat. Operated less than six months. Excellent appearance and condition. Will be demonstrated by owner. Located vicinity New York. No. 512-SS.

BUCYRUS-ERIE E-2 DIESEL SHOVEL. 26' boom 15' dipper handle—1½ yard dipper. Good repair and operating condition. Located Boston. Box 891-SS.

BUCYRUS-ERIE E-2 DIESEL SHOVEL AND DRAGLINE. 27' shovel boom 15' dipper handle—1½ yard dipper—50' dragline boom and equipment—no bucket—Kohler light plant. Atlas four cylinder 7½"x10½" engine. Box 892-SS.

BUCYRUS-ERIE 43-B GAS SHOVEL AND DRAGLINE. 23' shovel boom—17' dipper handle—1½ yard dipper 50' boom dragline equipment. No bucket. Electric starter. Wisconsin Model E-six cylinder 6"x7" gas engine. Excellent condition. Located Eastern Pennsylvania. Box 893-SS.

TWO LORAIN 75-B COMBINATION 1½ CUBIC YARD SHOVEL AND 50' BOOM DRAGLINES — without buckets. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SS.

OSGOOD "VICTOR" 1½ CUBIC YARD SHOVEL AND 50' BOOM CLAMSHELL MACHINE. Gasoline Power. Good operating condition. Located Minneapolis. Box 760-SS.

P & H MODEL 700—1½ CU. YD. GASOLINE SHOVEL. Engine: Waukesha 4-cyl. 7½"x8" Engine. Fair working condition. Located New Mexico. Bargain price. Box 789-SS.

1¾-YARD

BUCYRUS-ERIE 43-B CHAIN CROWD SHOVEL AND CLAMSHELL MACHINE. 22' Shovel Boom—16' Dipper Handle—1¾ yd. Dipper. 50' Boom Clamshell Equipment—no Bucket. Wisconsin Gasoline Engine. First-class operating condition. Located New York City. Box 856-SS

5—**MARION MODEL 37,** 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 825-SS.

SMALL DRAGLINES
Under 2 Yards

⅜-YARD

⅜-YARD SARGENT SCOUT DRAGLINE. Powered with McCormick-Deering Model 200 4-cylinder 4¼x5 heavy duty gas engine. Cable speed 160 fpm, single line. Two traveling speeds. Capacity as crane from 8000 lbs. at 8 ft. radius to 2800 lbs. at 24 ft. radius. Iowa. Box 772-SD.

UNIVERSAL-UNIT ¾ swing combination 30-foot boom gasoline dragline and ⅜ cu. yd. shovel. ⅜ cu. yd. dragline bucket. Working every day. Good condition. Located Grand Haven, Michigan. Box 769-SD.

½-YARD

BUCYRUS-ERIE — 1020 GASOLINE DRAGLINE—CLAMSHELL—35' Boom. No buckets. Electric starter. Lighting equipment. Waukesha 4 cylinder 4¾"x6¼" engine. Good condition. Located Chicago. Box 909-SD

¾-YARD

LORAIN GAS DRAGLINE—CLAMSHELL. 40' Boom. ¾ yard capacity. Good condition. Box 911-SD

BUCYRUS-ERIE 20-B COMBINATION STEAM DRAGLINE - CLAMSHELL - SHOVEL. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SD.

1-YARD

BUCYRUS-ERIE DA-2 DIESEL-AIR 40' BOOM DRAGLINE. No bucket. Atlas Diesel engine. Located Eastern Pennsylvania. Box 872-SD.

BUCYRUS-ERIE D-2 DIESEL DRAGLINE including 1¼ yd. Page RS drag bucket. Located Texas. Box 868-SD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

SMALL DRAGLINES
Under 2 Yards
continued

BUCYRUS-ERIE GA-2 COMBINATION DRAGLINE AND SHOVEL. 50' Dragline Boom including Fairlead but not Bucket. 22'6" Shovel Boom, 16' Dipper Handle, 1 cubic yard cast front inserted tooth Dipper. Air starter. Good condition. Located Newark. Box 718-SD.

LINK-BELT 1 CUBIC YARD CAPACITY 50' BOOM DRAGLINE WITHOUT BUCKET. Gasoline power. Reported good operating condition. Located near Chicago. Box 724-SD.

P&H—MODEL 600—Combination 40' boom dragline and 1 yard shovel including dragline bucket. Waukesha gasoline engine. Machine in fair operating condition. Located Georgia. Box 695-SD.

1¼-YARD

BUCYRUS-ERIE — DIESEL-AIR — COMBINATION DRAGLINE AND SHOVEL. 22'6" Boom—16' Dipper Handle—1¼ cubic yard Inserted Tooth Dipper. 45' Boom—Complete Dragline Equipment without bucket. Engine—Atlas Diesel. Located Los Angeles, Cal. Good operating condition. Box 703-SD.

BUCYRUS-ERIE 34-B DIESEL DRAGLINE. 45' boom—Atlas six cylinder 6¼"x8" engine. Standard single shaft cat. No bucket. Used approximately one year. Field reconditioned. Located San Francisco. Available about Sept. 1. Box 877-SD.

LORAIN 75 GAS—50' BOOM DRAGLINE. No bucket. Waukesha four cylinder 6¾"x8" engine. Reported excellent condition. Located Eastern Pennsylvania. Box 888-SD.

MARION MODEL 450 ELECTRIC DRAGLINE AND SHOVEL 23' Shovel boom. 16½' dipper handle with new racking. 1¼ yard dipper. 45' dragline boom and machinery included. ¾ yard drag bucket. Suitable for power supply 3 phase, 60 cycle, 2300 volts. Excellent condition throughout. Located near Chicago. Box 914-SD

1½-YARD

2 LORAIN 75-B COMBINATION DRAGLINES AND SHOVELS. 50' dragline booms without buckets. 1½ cubic yard shovel equipment. Gasoline power. Good working condition. Located eastern Pennsylvania. Box 721-SD.

TWO P&H 700 DRAGLINES. 1½ cu. yd. buckets on 50' booms. Gas and Diesel. Located Lower Rio Grande Valley, Texas. Box 618-SD.

SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅜-YARD

BAY CITY "PUP" CLAMSHELL MACHINE. Good operating condition. Box 514-SCC.

½-YARD

BUCYRUS-ERIE — 1020 GASOLINE CLAMSHELL—DRAGLINE—35' Boom. No buckets. Electric starter. Lighting equipment. Waukesha 4 cylinder 4¾"x6¼" engine. Good condition. Located Chicago. Box 909-SCC

BYERS BEARCAT CLAMSHELL—Crane—30' boom. Will handle ½ cubic yard bucket. Located near Grand Rapids, Mich. Box 648-SCC.

ORTON 24' BOOM—½ CUBIC YARD CLAMSHELL MACHINE. ½ cubic yard Owen Clamshell Bucket. Hercules 55 HP. Gasoline Engine. Factory rebuilt 1932. Good operating condition. Located Tennessee. Box 709-SCC.

¾-YARD

BUCYRUS-ERIE 20-B COMBINATION STEAM CLAMSHELL—DRAGLINE—SHOVEL. Good working condition. Caterpillar Mounted. Located near Racine, Wis. Box 701-SCC.

LORAIN GAS CLAMSHELL—DRAGLINE. 40' Boom. ¾ yard capacity. Good condition. Box 911-SCC

O & S MODEL "T" ¾ yard clamshell machine. 40' boom. Good working condition. Powered with Climax 5½"x7" gasoline engine. Located near St. Louis. Good working condition. Box 651-SCC.

1-YARD

BUCYRUS-ERIE GA-2—45' BOOM CRANE. Waukesha gas engine. First class operating condition. Located Tennessee. Box 816-SCC.

1¼-YARD

1¼ YD. OSGOOD MODEL 2498 GAS, 40' boom. Clamshell equipment including bucket. Excellent operating condition. Favorable price. Located Springfield, Ohio. Box 859-SCC.

NORTHWEST MODEL 105 Gasoline—40' boom clamshell. Good operating condition. Located Iowa. Box 516-SCC.

1½-YARD

OSGOOD "VICTOR" 50' BOOM CLAMSHELL MACHINE AND 1½ CUBIC YARD SHOVEL. Gasoline Power. Good operating condition. Located Minneapolis. Box 760-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

1½-W MONIGHAN WALKER. Diesel power. 2 yard capacity. 60-foot boom. Good condition. Reasonably priced. Located Kansas. Box 742-LSD.

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL-DRAGLINE. 26' boom, 17' dipper handle, 2 cubic yard dipper. 60' boom dragline equipment including 2 cubic yard Page Class M bucket and steam operated lighting plant. Machine can be placed in operation quickly with installation few small parts. Very attractive price. Located Alabama. Box 842-LSD.

2-W MONIGHAN WALKER, 3½ yard capacity. 70-foot boom. Good condition. Reasonably priced. Located Kansas. Box 743-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 751-LSD.

TYPE 175-B ELECTRIC, No. 794 equipped with 87' shovel boom, 48' dipper handle, 3½-yd. bucket, and dragline equipment including 125' boom, and 3½-yd. bucket. This machine was recently reconditioned and is in good operating condition. Present location, Connecticut. Box 263-LSD.

BUCYRUS-ERIE—50-B—DIESEL SHOVEL. 38' Boom, Two 19' Dipper Handles. 1¼ Cubic Yard Rock Bucket and 1¾ Cubic Yard Dirt Bucket. 60' Boom Dragline Equipment without bucket included. Shovel only located Montana. Dragline equipment located Minnesota. Box 785-LSD.

BUCYRUS-ERIE 50-B, 1¾ yard steam shovel, steel cab, may be inspected. Located Minnesota. Box 827-LSD.

PRICE VERY ATTRACTIVE

BUCYRUS-ERIE 50-B STEAM COMBINATION SHOVEL AND DRAGLINE, shop number 10557. 26' boom, 17' dipper handle, 2 yd. dipper. 50' boom dragline equipment, 1¾ yd. Page bucket. 1 KW 32 volt Moon electric light plant. 54"x9'7" standard coal burning locomotive-type boiler. Also 2 steel under-frame flat cars on which machine is now loaded. New 1929. Moved only 250,000 yards of material. Excellent condition. Price very attractive. Located Kansas City, Mo. Deal direct with owner. Box 900-LSD

100-B STEAM SHOVEL, 3 yd. dipper, located Eastern Canada. Immediately available. Used—good condition. Box 669-LSD.

100-C BUCYRUS STEAM SHOVEL on trucks. 3½-yard dipper. New 1914. Willing to sell very cheap. Located near Allentown, Pa. Box 807-LSD.

50-B STEAM SHOVEL, Number 3946; equipped with 1½-cubic-yard dipper, 26-foot boom, also 1½-cubic-yard dragline bucket with 50-foot boom caterpillar mounted, equipped for burning oil, located at Texarkana, Ark. Price $3,000. Box 112-LSD.

PAGE DRAGLINE, track mounted, 90-foot boom, 3½-yard Page RC bucket with new 150 h.p. Venn-Severin Diesel engine. Thoroughly overhauled and rebuilt in 1935. Now working in Indiana. Box 768-LSD.

ANY FAIR OFFER ACCEPTED

Class 24 steam dragline. 100 foot boom, 5 cubic yard bucket. Skid and roller mounted. Rebuilt 1927 at a cost of $15,000. New locomotive boiler installed 1928. Will accept any fair offer. Located near Fort Worth, Texas. Box 823-LSD.

FOR SALE OR RENT

TWO CLASS 14 STEAM DRAGLINES, 70-foot booms and 2-yd. buckets. Caterpillar mounted. Equipped for burning gas or oil. Located in southwest. Price at approximately $4,000 each. Box 821-LSD.

CLASS 320 STEAM DRAGLINE. 144-foot boom. 8-yard bucket. Located on Illinois River. A good buy. Box 750-LSD.

CLASS 14 DIESEL-ELECTRIC DRAGLINE, 70-foot boom. 2-yard bucket. Immediately available. Located near St. Louis. Box 749-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 347-LSD.

MARION 480 2-YARD STEAM SHOVEL, good working condition. Substantial saving. Located in Minnesota. Box 826-LSD.

BUCYRUS-MONIGHAN 3-W walking dragline. 85' boom, 2½-yard bucket. Located Stovall, Miss. Box 843-LSD.

BUCYRUS-ERIE, 70-C, 2½-yard steam shovel, railroad type. Located in Minnesota. Box 829-LSD.

P&H MODEL 900, 3½ yard Diesel Shovel. 33-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 828-LSD.

CLASS 14 DIESEL ELECTRIC DRAGLINE for sale. 70' boom. Can be seen working during next 30 days. Good price. Southern location. Box 846-LSD.

BUCYRUS-MONIGHAN 4-W Walking dragline. 80' boom 5½-yard Page bucket, 30' boom insert and 4-yard bucket. Located Tennessee. Box 844-LSD.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

3—MARION 92-M, 4-YARD RAILROAD TYPE steam shovels located near Hibbing, Minnesota. Box 830-LSD.

BUCYRUS-ERIE 50-B Steam shovel, located Montana. Attractive price. Box 845-LSD.

68-C BUCYRUS ELECTRICALLY OPERATED SHOVEL, equipped with 2½-yard manganese front dipper, 3 phase, 60-cycle, 440-volt motors, transformers, cable, reel and approximately 1400 feet of cable all in excellent condition. Reasonable price. Address Box 268-LSD.

MONIGHAN DRAGLINE MODEL T, 2-cubic-yard 60-foot boom located near Wichita, Kansas. About seven years old. Has recently been thoroughly overhauled. Box 180-LSD.

MONIGHAN STEAM DRAGLINE, two cubic yards capacity. 60' boom. Horizontal locomotive-type boiler. 2½-yard Page bucket. In good operating condition; overhauled in 1931 and not used. Located Iowa. Box 770-LSD.

CLASS 14 STEAM DRAGLINE, 60' boom. 2 cubic yard Page bucket. Locomotive-type boiler. Thoroughly overhauled and ready for service. Located Iowa. Box 771-LSD.

TWO 3-W MONIGHAN WALKERS. 3½ yards. 70- and 77-foot booms. Good condition. Reasonably priced. Located Louisiana. Box 745-LSD.

BUCYRUS 320-B STEAM STRIPPING SHOVEL, shop number 4205, new in 1925, used less than four years. Located at Toronto, Ohio. Box 74-LSD.

2-W MONIGHAN WALKER. 2½ yard capacity. 70-foot boom. Good condition. Priced reasonably. Located Louisiana. Box 744-LSD.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer

South Milwaukee, Wisconsin

LOCOMOTIVES

LOCOMOTIVES

2 BALDWIN, 17x24, straight drive standard gauge 45 ton locomotives. 54 inch boilers. Shop numbers 33962 and 33266. Each one has passed State Boiler Inspection yearly. Boilers will stand cold water test of 240 lbs. At present in actual service in Minnesota mine. Box 152-ME.

LOCOMOTIVE CRANES

LINK-BELT STEAM LOCOMOTIVE CRANE. 50' Boom. 8 Wheel—M.C.B. 54' A.S.M.E. boiler. Weight 70 tons. Lifting capacity 43,000 lbs. at 12' radius. Located vicinity of Chicago. Box 915-ME

AMERICAN STEAM LOCOMOTIVE CRANE. 8 wheel—25 ton capacity. Equipped with Steam brakes and train air line. Boiler 54"x 8¼"x10" double cylinder engine. Boom 50'. 101" ASME—180 pounds pressure. Standard gauge 4'x8½". Used only eight months. Splendid condition. Box 628-ME.

MISCELLANEOUS EQUIPMENT

One complete 1½ cu. yd. SAUERMAN POWER CRESCENT SCRAPER. Complete equipment necessary for operating on 700 ft. span. All new, never used. Box 903-ME

COMPLETE CONTRACTORS EQUIPMENT

Offered for sale by Southern contractor. Priced to sell.

7—Railroad Type Steam Shovels 2½ to 5 yd.
3—Full Revolving Shovels, ¾ yd.
1—Gasoline Clamshell Crane, ½ yd.
2—Jordan Spreaders.
2—Locomotives, 26 Ton, American Saddle Tank.
32—12-yd. Western Heavy Duty Dump Cars.
1—Flat Car.
3—Camp Cars.
2—1-bag Gasoline Concrete Mixers.
Pumps, Boilers, Jacks and Other Tools.

For further particulars, Address Box 138-ME.

REBUILT LOADMASTER

Model "MD" Loadmaster with McCormick-Deering Model 20 tractor, 14' boom, solid rubber tires, can be had at exceptional saving. For further particular write Tractor & Equipment Company, 433 South Jefferson St., Chicago, Illinois.

COMPLETE EQUIPMENT for 2 strip mines, contractors or quarry operations, No. 300 and No. 36 Marion steam shovels, well drills, locomotives, 4 to 15 yd. cars, crushers, picking tables, loading booms, cable and button retarders, compressors, motors, transformers, flood and search lights, camp equipment and new repair parts for above. Box 195-ME.

SHOVEL FRONT ENDS

1½ cu. yd. shovel front end—new dipper—for Marion 32 steamer. Priced right. Located near Chicago. Box 857-ME.

SHOVEL FRONT ENDS

ONE COMPLETE 52-B DIESEL SHOVEL FRONT END. Consists of boom, dipper handle and 2¼ cu. yd. dipper.

TWO COMPLETE 52-B ELECTRIC SHOVEL FRONT ENDS. Consist of Booms, dipper handles and 2¼ cu. yd. dippers. Motors on booms are 3-phase, 60 cycle, 2300 volt current. Box 741-ME.

SHOVEL FRONT ENDS

Two complete shovel front ends for Bucyrus-Erie 42-B steamers. 21' booms, 15' handles, 1½ cu. yd. Vanderhoef dippers. Priced to sell. D. E. Horton Constr. Co., Buffalo, N. Y.

ONE (1) PARSONS No. 40 TRENCHING MACHINE, 18' ladder with buckets for from 18 to 42" trench. In good mechanical condition. Located in St. Louis, Missouri. Price $5000.00 F.O.B. cars. Box 740-ME.

DIPPERS—2½ CU. YD.

2—2½ cubic yard dippers for 70C Bucyrus steam shovel. One of these dippers is in good condition and the other has not been used since being rebuilt. Has set new Westico teeth. For particulars write Foley Brothers, Inc., New York Building, St. Paul, Minn.

WANTED

TEN AIR-DUMP CARS, 20-yd. capacity, modern design. Prefer Western or Case Crane & Kilbourne Jacobs. Standard gauge with railroad interchange, side frame trucks, steel floors, etc. Write full particulars. Box 905-ME

WANTED

MODEL 60 WILEY WHIRLER STEAMER. Give complete details including age, condition, location, approximate shipping weight, and price. Box 904-ME

WANTED

ONE UNIVERSAL CRANE mounted on Mack chassis. Give full particulars. Box 906-ME

WANTED

USED ASPHALT PLANT. Give make, size, age, codition, location and price. Also approximate shipping weight. Box 917-ME

WANTED

USED 1½ YD. SHOVEL ATTACHMENT for Link Belt Dragline Model K-38. Give complete information including shipping weight and price. Box 916-ME

DRAG SHOVEL ATTACHMENT A BARGAIN

BRAND NEW PAGE DRAG SHOVEL EQUIPMENT suitable for application to Bucyrus-Erie 1030, 1035, or 32-B machines now in the field, consisting of 17'1½" boom, 11' dipper handle, and two ¾ cubic yard dippers; one 38" wide over cutters—the other 49¼" wide over cutters together with auxiliary A frame and ropes. Priced below cost. Box 683-ME.

NO. 44 BARBER-GREENE DITCHER in good condition. Located near Polo, Illinois. Box 824-ME.

PARTS—175-B Shovel—PARTS

1 Main Engine
1 Boom
1 Dipper Shaft
1 Crowding Engine
1 Five Yard Dipper

If interested in making a good buy on these shovel parts, write us. Box 607-ME.

MINING AND QUARRY EQUIPMENT

The following equipment is located in Minnesota. Full details on request.

5—Boilers
12—36" gauge Koppel double truck flat cars.
6—36" gauge Peteler 4-yard two way dump cars.
3—Crushers.
4—Swing & Boom engines for Marion 31 & 36 shovels.
1—Austin-Western grader, 8' blade & scarifier.
4—Hoists—Single and double drum.
3—Milwaukee gasoline locomotives, 7-ton 24" gauge.
2—Whitcomb gasoline locomotives, 7-ton, 24" gauge.
4—Electric motors, 100 to 150 h.p.
9—Pumps—Steam and gasoline.
5—Redwood tanks.
1—Special Twin City Tractor.
1—Complete Ainley Placer gold machine.

Box 833-ME.

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BUCYRUS-ERIE COMPANY

Headquarters: SOUTH MILWAUKEE, WISCONSIN, U. S. A.
Works: South Milwaukee, Wis., Erie, Pa., Evansville, Ind.

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ONTARIO, TORONTO: F. H. Hopkins & Co., Ltd., Commerce & Transportation Building.
QUEBEC, MONTREAL: F. H. Hopkins & Co., Ltd., Dominion Square Building.

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Ruston-Bucyrus Limited

Headquarters and Works: LINCOLN, ENGLAND
London Office, Imperial House, 15, 17, 19, Kingsway, W. C. 2

ABYSSINIA: W. H. Miles, Esq., 41, Osmond Road, Hove, Sussex, England.
AUSTRALIA: Ruston & Hornsby (Australia), Pty., Ltd., Melbourne, Sidney and Brisbane.
AUSTRIA: "Garbe" Aktiengesellschaft fur Landwirtschaftliche Maschinen und Kraftfahrzeuge, Dresdnerstrasse, 27 Vienna.
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